RED FLAGS AND CHOKE POINTS

PROCUREMENT NETWORKS BEHIND ISLAMIC STATE IMPROVISED WEAPON PROGRAMMES

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Front cover image: Conventional and improvised mortar rounds and other projectiles captured from Islamic State forces in Tal Afar, Iraq, November 2017.

Inside cover image: Drums of aluminium paste seized from Islamic State forces by Iraqi forces, stacked prior to documentation in Tal Afar, Iraq, November 2017.

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LIST OF ABBREVIATIONS

AN 33	33 per cent Ammonium Nitrate
ANAL	Ammonium Nitrate–Aluminium
CAR	Conflict Armament Research
CEO	Chief Executive Officer
EPOS	Electronic Point-Of-Sale
HME	Homemade Explosives
HS	Harmonized System
IED	Improvised Explosive Device
IP	Internet Protocol
IS	Islamic State
UAE	United Arab Emirates
UAV	Unmanned Aerial Vehicle
VoIP	Voice Over Internet Protocol

KEY FINDINGS

- Until their territorial defeat, Islamic State (IS) forces' weapon production programmes in Iraq and Syria procured key commodities through groups of linked, family-owned companies and individuals located near key border crossings into IS-held territory. These groups were centred around the towns of Siverek and Akçakale in southern Turkey.

- These family groupings helped to procure multiple commodities – often unrelated to their primary businesses – and in some cases arranged their movement into Syria. There is no evidence that they were witting accomplices to IS procurement efforts or were guilty of any wrongdoing. They nonetheless acted as key junction points within the supply chains that provisioned IS forces: consolidating shipments of multiple commodities for onward distribution. Such groupings therefore constituted choke points in IS forces' supply chains: points *en route* potentially vulnerable to law enforcement disruption.

- Purchases of bulk explosive precursors and electronic items through this network had unusual features, which made them potentially detectable. 'Red flags' included the following:

  → companies made large purchases of products that were incongruent with their business activities. For example, a small mobile phone shop purchased six tonnes of aluminium paste from a large chemical distributor.

  → parties ostensibly unconnected with the purchaser paid for products, or had products consigned to them. For example, a fertiliser dealer, together with an associate, paid nearly USD 200,000 for a consignment of 78 tonnes of a food additive (sorbitol) that was shipped to two Syrian companies via IS-held territory. Similarly, a UK-based company operated by an IS member purchased high-specification motion-control units from a North American company, but an unrelated luxury car-hire company in Istanbul executed the payment of more than USD 18,000 on behalf of the UK company. The same UK company purchased rocket and unmanned aerial vehicle (UAV) components from companies in North America and Germany but asked the sellers to ship them to the address of a mobile phone shop in Şanlıurfa, close to the Turkish–Syrian border.

- IS forces' procurers also sought goods and intangible knowledge to develop new, ambitious improvised weapon systems. Their efforts included purchasing technical plans for a pulsejet engine with the intention of developing large, high-speed UAVs; and contracting suppliers for an automated anti-aircraft system.

ISLAMIC STATE PURCHASES INCLUDED TECHNICAL PLANS FOR A PULSEJET ENGINE IN ORDER TO DEVELOP HIGH-SPEED UAVs.

METHODOLOGY

CAR field investigation teams document illicit weapons, ammunition, and related materiel in conflict-affected locations and trace their supply sources.

The teams inspect weapons and other items in a variety of situations—whether recovered by state security forces, surrendered at the cessation of hostilities, cached, or held by insurgent forces. They document all items photographically, date and geo-reference the documentation, 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 to CAR investigations. If numerous individual items were to be traced, an excessive burden would be placed on the national governments and manufacturing companies concerned. Furthermore, some 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 by analysing physical evidence gathered from the weapons themselves and from related materiel; obtaining government, commercial, transport, and other documents; and interviewing individuals with knowledge or experience of the equipment transfers under scrutiny.

▲ CAR supplements formal weapon tracing with analysis of physical evidence gathered from the weapons themselves and related materiel.

CAR retains all documents, interview notes, emails, recordings, photographs, and other data obtained from third parties in a secure, encrypted format. Wherever relevant, CAR publications refer to these items as being 'on file'. To protect its sources, CAR is unable to publish all details about them or the circumstances under which it acquired certain items. 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 open access publications do not refer to private individuals by name, except in the case of well-known public officials.[1]

CAR has contacted all governments and companies substantively referenced in this report. Unless specified, no reference to the names of countries of manufacture, manufacturing companies, intermediary parties, distributors, intended end users, or other individuals or companies 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.

1. INTRODUCTION

From 2014 to 2017, IS forces in Iraq and Syria established one of the most sophisticated production capabilities for improvised weapons and improvised explosive devices (IEDs) of any non-state group to date. Coordinated across IS-held territory, production became increasingly technically advanced and quasi-industrialised as it drew on the bulk procurement of goods and raw materials through international supply chains (CAR, 2016c).

Goods moved remarkably rapidly though IS forces' supply chains. Security units fighting against IS forces during this period recovered improvised weapons and IEDs, which incorporated components and explosive precursors that had been manufactured in Europe and Asia as little as six months earlier (CAR, 2016a). IS forces were not simply looting goods from the territories that they had occupied; at least until 2016, they relied heavily on effective resupply from outside the territories they held.

From 2014 onwards, CAR's field investigations in Iraq and Syria sought to map these international supply chains. CAR identified more than 50 companies, in over 20 countries, that produced or distributed goods that IS forces subsequently used to make IEDs, UAVs, and improvised weapon systems (CAR, 2016a).

These companies included manufacturers and distributors of chemicals used in the production of explosives or chemical agents; manufacturers of items used as containers for IEDs and IED main charges; producers of commercial explosives; and companies making products ranging from electronic components to complete, commercial off-the-shelf UAV systems.

Since 2019, CAR investigations have tried to fill in the gaps in this picture, seeking to determine how key items were moved from their unwitting regional distributors to IS forces' weapon production facilities. This report presents interim findings from ongoing CAR investigations into these human, financial, and logistical networks.

These investigations have two objectives:

- **to reveal how IS procurement networks operated**, and therefore to help identify 'choke points' where similar networks might be vulnerable to disruption in the future; and

- **to determine how IS procurement efforts appeared to unwitting suppliers**, in order to help manufacturers, distributors, and service providers to identify indicators ('red flags') of suspicious procurement and diversion by similar or affiliated groups.

▼ **Components for the construction of pressure plates for IEDs, photographed in Hawija, Iraq, November 2017.**

▲ Vehicles destroyed in the battle to retake west Mosul from IS forces, May 2017.

This report therefore pays detailed attention to the ways in which procurers presented themselves to commercial manufacturers and distributors, the nature and content of communications with those manufacturers and distributors, the payment methods used, and how goods were physically moved.

CAR investigations for this report have begun with the formal tracing of commercial goods and components that CAR field investigation teams either found in IS forces' abandoned weapon workshops or documented following IED and improvised weapon finds and incidents (CAR, 2016a; 2017b). To map these items' onward transfers, CAR has interviewed suppliers and purchasers in Europe, the Middle East, and North America; has obtained sales, customs, and transport documentation; has examined internal documentation of IS forces themselves; has reviewed court records in Denmark, Turkey, and the United States; and has mapped companies and individuals through corporate, census, and cadastral records from Hong Kong, Lebanon, Turkey, the United Arab Emirates, and the United Kingdom. **There is no suggestion that any of the companies or individuals identified or referenced in this report were complicit in the diversion of their products to IS forces' weapon production efforts, or otherwise committed any wrongdoing.**

This report examines a selection of five key commodity groups in this documentation sample:

- **nitrate-based fertilisers**, used to produce homemade explosives (HME);
- **aluminium paste**, also used to produce HME;
- **sorbitol**, used to produce rocket propellant;
- **commercial UAVs**, which IS forces used in large numbers for surveillance, indirect fire guidance, and to deliver small IEDs; and
- **a range of items procured for the development or manufacture of specialised UAVs and related weapon platforms**, including engines, component designs, optical systems, and bespoke software.

CAR continues to investigate the procurement mechanisms that IS forces used to acquire commercial explosives—particularly detonators and detonating cord. CAR expects to report on these investigations in forthcoming publications.

This report does not present an exhaustive, or even necessarily representative, account of IS forces' procurement networks. Rather, it focuses on some of the most numerous and geographically widespread commercial items that CAR field investigation teams physically documented in Iraq and Syria between 2014 and 2017.

In parallel to CAR's work, law enforcement and journalistic investigations have revealed other networks and procurement mechanisms employed by IS forces. Critically, some of the networks identified in these investigations share locations, working practices, and personnel with the networks presented in this report (Københavns Byret, 2019; USDC Maryland, 2017; US Treasury, 2019). These overlaps and interconnections suggest that CAR's sample of cases, although generated opportunistically, involve individuals and routes that were central to IS forces' procurement networks.

2. CHOKE POINTS: FAMILY-LINKED TRADERS AT BORDER CROSSINGS

Cross-border procurement operations of the scale and efficiency seen in IS forces' weapon production require that individuals, working in collaborative networks, are able to:

- make repeat or bulk purchases;
- operate registered companies or other legal entities to front large purchases and payments;
- arrange logistics for the delivery of goods into IS territory; and
- move money through bank transfers or online payment systems.

Previous investigations and prosecutions indicate that IS forces used individuals and companies based in Denmark, Spain, Syria, Turkey, and the UK to fulfil these functions (Albæk et al., 2020; Københavens Byret, 2019; Rassler, al-'Ubaydi, and Mironova, 2017; USDC, 2017). The activities of these widely dispersed networks were difficult to detect in real time, as they occurred across multiple jurisdictions.

CAR's investigations indicate that the supply chains for a range of commodities procured by IS forces, while initially appearing unconnected, in fact involved the same individuals and businesses, primarily based in the Turkish border town of Akçakale and the nearby city of Şanlıurfa (see Map 1). They acted as consignees and sometimes purchasers of numerous different goods (see Figures 5 and 10).

A report produced by the Islamic State Border Crossing Security Department in the Syrian town of Tal Abyad (directly opposite Akçakale) suggests why IS forces may have routed supply chains through particular places in this way (IS BSCD, 2015). The report, which Syrian opposition forces recovered in late 2015 in Tal

▼ A CAR investigator photographs weapon remnants in Abu Sayf, south of Mosul, Iraq, May 2017.

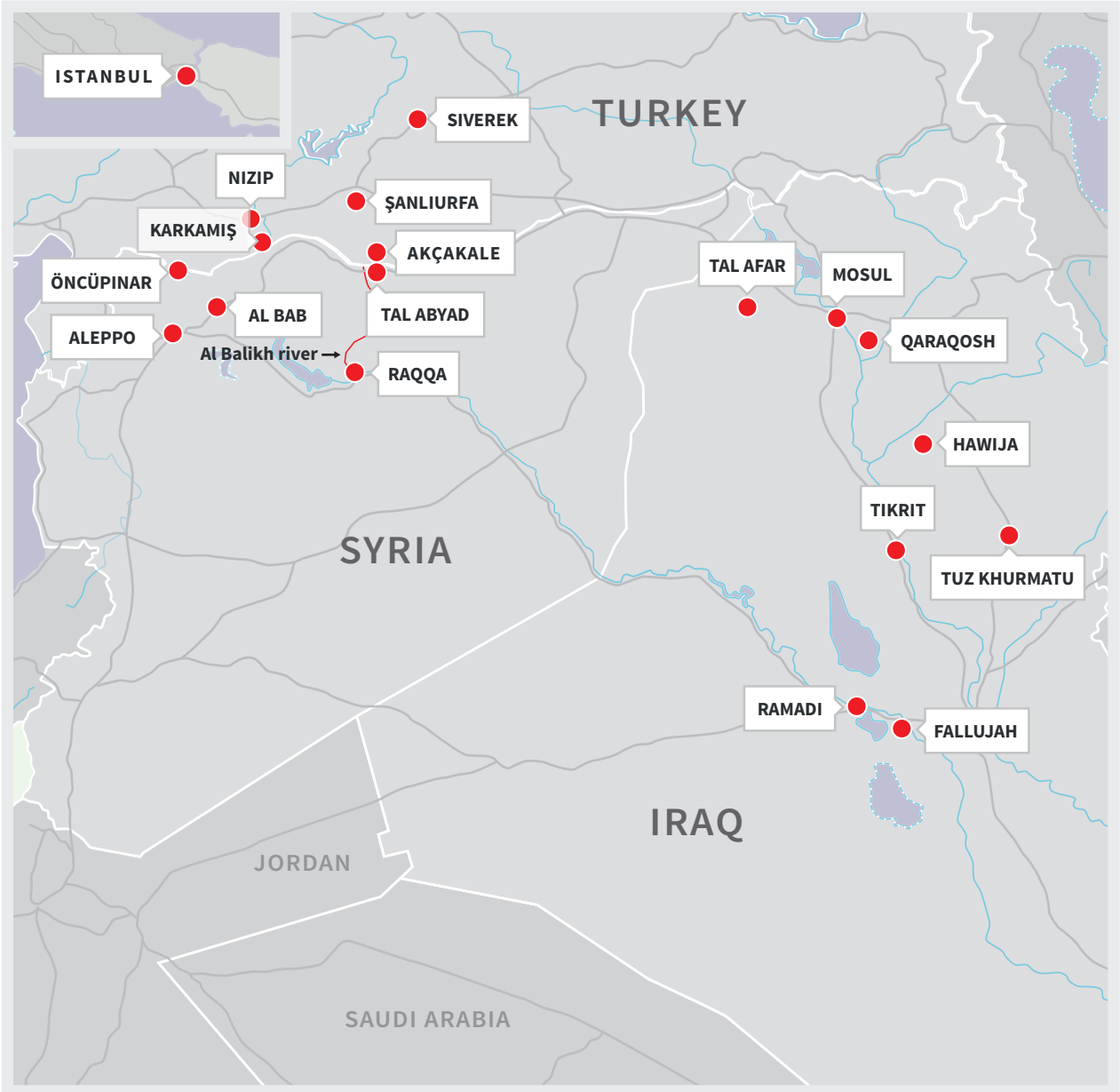
Abyad, states that IS officials coordinated with established cross-border smugglers, who paid local Turkish officials to allow the passage of goods across the Akçakale border gate.[2]

The border crossing system outlined in the Border Crossing Security Department report suggests that IS procurers may have had to consign multiple shipments of goods to individuals (not necessarily smugglers themselves, or even aware of IS involvement in the transaction) who were located close to key border crossings, where they could ensure uninterrupted logistics. These individuals would consolidate multiple shipments of goods on Turkish territory, prior to the goods' movement across the border into Syria.

Through triangulating commercial documentation and interviews with suppliers, CAR confirmed that a single family in Şanlıurfa, Turkey, was one such junction point. This family was the purchaser or consignee of aluminium paste, UAV components, and surveillance equipment.

Map 1

Key locations mentioned in this report



2.1 ALUMINIUM PASTE AND UAV COMPONENTS

Between 2015 and 2017, CAR field investigation teams documented more than one hundred drums of Chinese-manufactured leafing aluminium paste, which they found in six separate explosives production sites set up by IS forces. The six sites were located across central Iraq, any two at least 70 km apart, suggesting widespread dispersion of the product among IS facilities (see Map 2). All of the drums had been manufactured by Hefei Sunrise Aluminium Pigments Co Ltd within an eight-month production period (see Table 1 and Figure 1). All of the drums also bore labels indicating that a single Istanbul-based chemical distributor had sold them. (There is no suggestion that this distributor was in any way complicit in supplying IS forces, or that it engaged in any other wrongdoing.)

Table 1

Lots and production dates of leafing aluminium paste drums manufactured by Hefei Sunrise Aluminium Pigments Co Ltd, documented by CAR in IS forces' explosives production facilities in Iraq, 2015–17

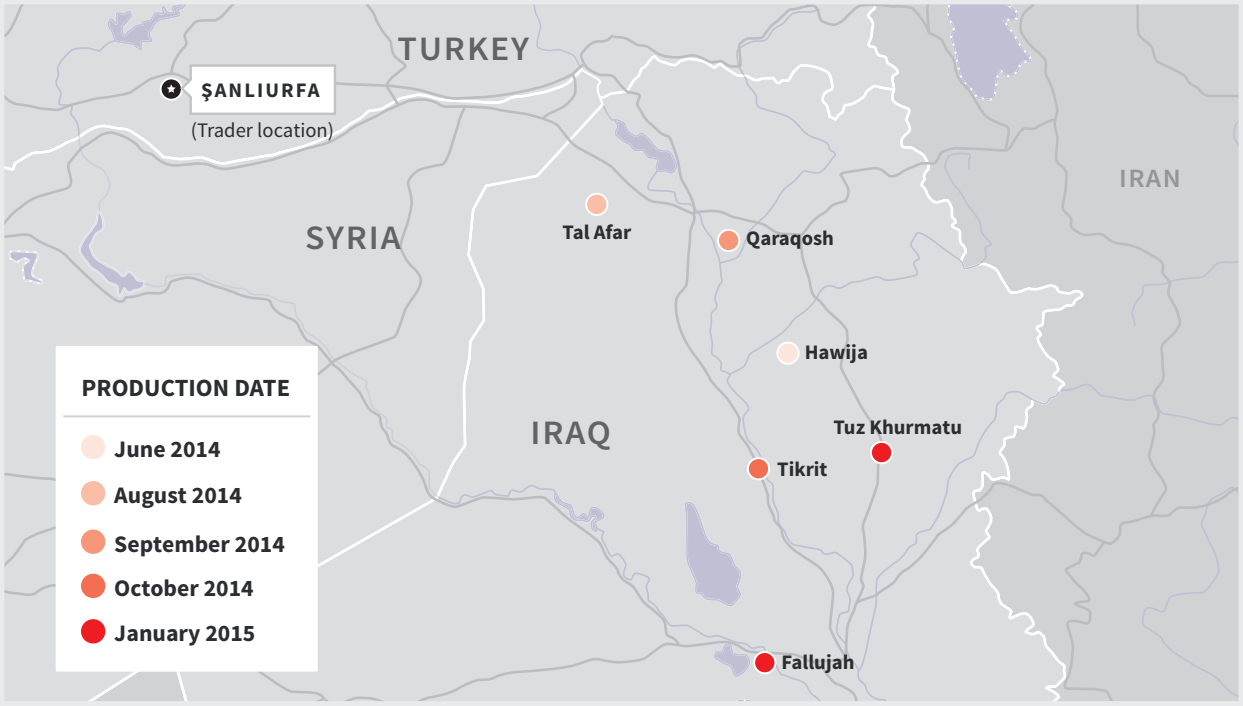
Lot number	Production date	Location of capture	Date captured	Date documented
140609156	9 June 2014	Hawija	5 October 2017	19 November 2017
140915259	15 September 2014	Qaraqosh	19 October 2016	11 November 2016
141010359	10 October 2014	Tikrit	2 March–17 April 2015	29 April 2015
141225544	25 December 2014	Tal Afar	20 August–25 September 2017 (recovered from locations throughout Tal Afar)	25 September 2017
150112661	12 January 2015	Fallujah	22 June 2016	29 June 2016
150118147	18 January 2015	Tuz Khurmatu	1 January–31 August 2016	22 September 2016
85 lot numbers between 140827258 and 150125148	27 August 2014 to 25 January 2015	Tal Afar	20 August-22 November 2017 (recovered from locations throughout Tal Afar)	22 November 2017

Figure 1

Chinese-manufactured leafing aluminium paste drums from an Istanbul-based distributor, captured from IS forces, documented by a CAR field investigation team in Tal Afar, Iraq, November 2017

Map 2

Recovery locations and production dates of leafing aluminium paste from Istanbul distributor

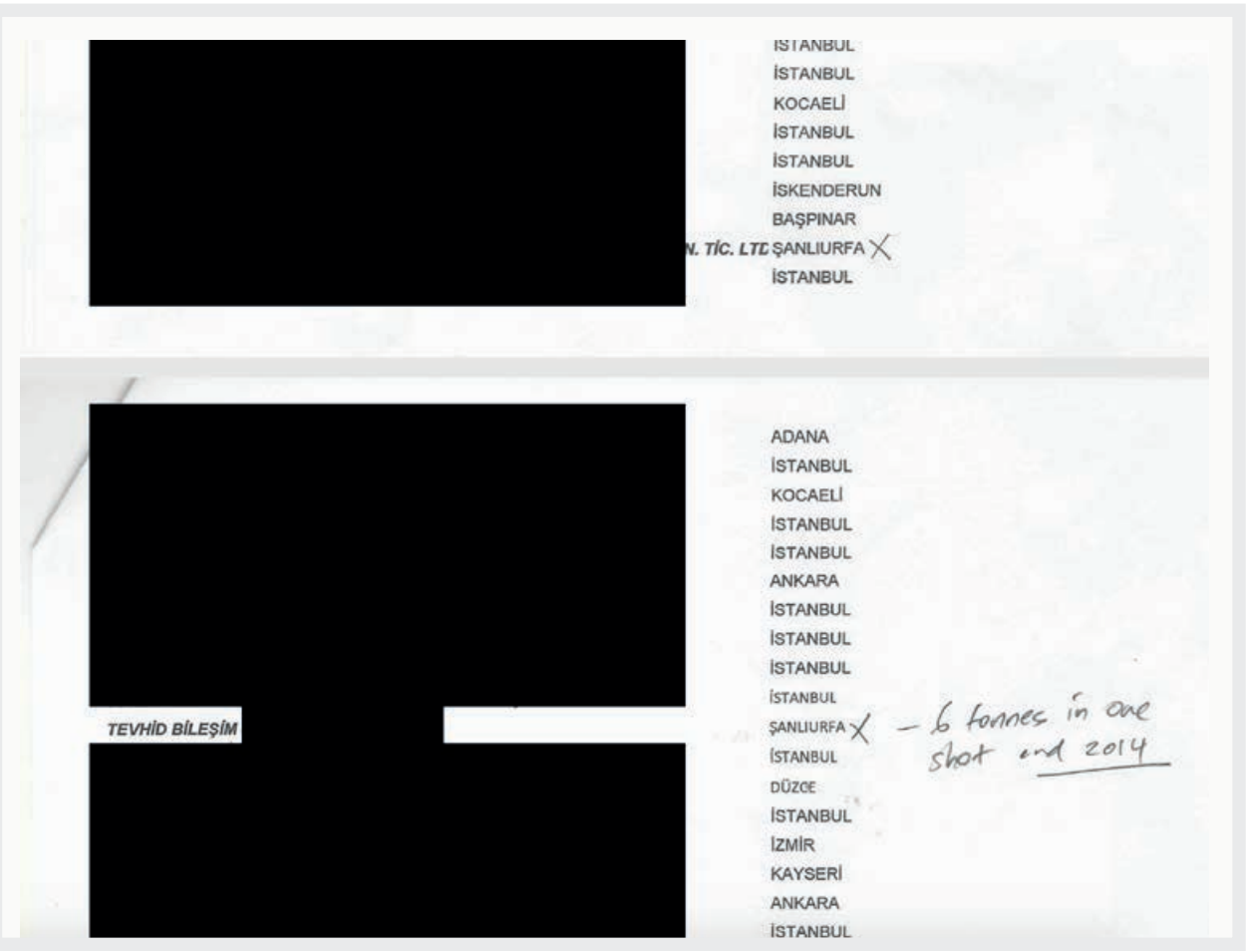


TEVHID BILIŞIM LISTED ITS BUSINESS AS THE IMPORT AND EXPORT OF MOBILE PHONES. IT WAS AN ATYPICAL PURCHASER FOR A LARGE ORDER OF ALUMINIUM PASTE—A MATERIAL PRIMARILY SOLD TO INDUSTRIAL MANUFACTURERS FOR USE IN PAINTS AND PROTECTIVE COATINGS.

The Istanbul-based distributor did not record sales by lot or batch number prior to 2018.[3] As a result, the distributor could not definitively identify the purchasers of the lots that CAR documented in Iraq. However, in reviewing its list of customers that had purchased leafing aluminium paste since 2013, the distributor noted one particular sale as unusual: a large order in late 2014 or early 2015 for 6 tonnes of aluminium paste, placed by a trader called Tevhid Bilişim, based in Şanlıurfa (see Figure 2).[4] This was the first and only order placed by Tevhid Bilişim with the distributor. The distributor told CAR that its full sales records from the period concerned were no longer extant, but it estimated that the price paid by Tevhid Bilişim was around USD 18,000.[5]

Figure 2

Part of a customer list provided by the Istanbul-based chemical distributor for leafing aluminium paste sales, 2013–18



Note: CAR has redacted the names of other companies on the list. A CAR investigator made the handwritten annotations during discussions with the distributor. The correct spelling of the trader as registered with the Şanlıurfa trade registry office is Tevhid Bilişim.

Source: Confidential

Tevhid Bilişim [translation: Tawhid Informatics] was registered with the Şanlıurfa trade registry office in June 2013. The registration listed an address on the first floor of a small shopping centre in the Yusufpaşa area of Şanlıurfa, Turkey, some 50 km north of the Akçakale border crossing into Syria (see Figure 3). It listed its business as the import and export of mobile phones (TOBB, n.d). Tevhid Bilişim was thus an atypical purchaser for a large and expensive order of leafing aluminium paste—a material primarily sold to industrial manufacturers for use in paints and protective coatings. Section 4 (below) explores these and other 'red flags' in detail.

Figure 3

Bağdat Pasajı shopping centre in Şanlıurfa, where Tevhid Bilişim was registered at an address on the first floor

Source: Google Maps © 2020 Google

Tevhid Bilişim also provided its Şanlıurfa address as the consignee address for international shipments of components intended for IS forces' weapon programmes in 2014–15, according to court records and CAR interviews with European technology and electronics suppliers (see also Figure 5). A UK resident, Siful Haque Sujan, organised these purchases. Although the final destination of these components remains unverified, criminal trials in the United States and Spain have established that Siful Haque Sujan was associated with IS forces (Dolz, 2020; USDC Maryland, 2017). According to the FBI, he had travelled to Raqqa, Syria, in mid-2014 and acted as an IT and weapon specialist for IS forces (USDC Maryland, 2016).[6]

In December 2014, one of Siful Haque Sujan's UK companies, Ibacstel Electronics Ltd, purchased a micro-turbine (a small turbojet engine) from a German supplier of turbines and civilian UAVs.[7] Ibacstel's primary business—which it advertised online—was the provision of electronic point-of-sale (EPOS) systems for restaurants and retail businesses. The company had no apparent connection to UAVs (Ibacstel, n.d.). Ibacstel paid EUR 2,400 (USD 2,995) for the micro-turbine by means of a bank transfer from its UK bank account; however, Ibacstel subsequently instructed the German supplier to dispatch the micro-turbine to the company address of Tevhid Bilişim in Şanlıurfa.[8]

Similarly, Siful Haque Sujan, and possibly other associates, ordered a range of UAV components and counter-surveillance equipment during 2015 (see Table 2). To make the orders and payments they used bank and Paypal accounts registered to Siful Haque Sujan's brother, to Ibacstel Electronics Ltd, and to a second UK-registered company, Advance Technology Global Ltd. (CAR has no evidence that Siful Haque Sujan's brother was necessarily aware of the use of his account in this way.)

Advance Technology Global Ltd was registered in July 2015 at the same address as Ibacstel Electronics, but using fictitious names for its directors and shareholders: 'David Soren' and 'Peter Soren' (Companies House, n.d.a). Unlike the majority of company registers, the UK's Companies House does not verify the identities or existence of the stated directors or shareholders of UK-registered companies.[9] Advance Technology Global Ltd advertised itself online as a supplier of drone surveillance, rockets, oil and gas machinery, and food production equipment (USDC Maryland, 2016).[10] This description was presumably intended to make the company appear to be a more plausible customer for UAV and rocketry components than Ibacstel Electronics. Siful Haque Sujan and his associates also invented several fictitious employees of Advance Technology Global Ltd—'Brian Vincer', 'Vijay Subramanian', and 'Peter Nix'—who would ostensibly discuss technical and business questions with suppliers via email.[11]

For each order, the company representatives either 1) instructed suppliers to send goods directly to an individual with the same name and address as the owner of Tevhid Bilişim; or 2) or to an individual sharing the same surname, at the same address in Şanlıurfa, or 3) arranged for an employee in the UK to collect the goods from the UK company's address and then redispatch them to the owner of Tevhid Bilişim in Şanlıurfa (see Table 2).

Table 2

Purchases of UAV components and counter-surveillance equipment by Siful Haque Sujan and accomplices, 2014–15

Date	Item	Cost	Supplier	Ordered in name of	Paid by	Dispatched to
24 December 2014	One micro-turbine	EUR 2,400 (USD 2,995)	German civilian UAV supplier	Ibacstel Electronics Ltd (EPOS supplier)	Bank transfer from Ibacstel Electronics Ltd	Tevhid Bilişim, Şanlıurfa
22 January 2015	Two scanner antennae	GBP 70 (USD 85)	UK electronics supplier	Ibacstel Electronics Ltd	PayPal account belonging to brother of Siful Haque Sujan	Ibacstel Electronics Ltd in UK, then dispatched on via courier to owner of Tevhid Bilişim, Şanlıurfa, on 26 January 2015
2 February 2015	Three surveillance detection units	USD 1,370	US surveillance equipment supplier (Florida)	Brother of Siful Haque Sujan	PayPal account belonging to brother of Siful Haque Sujan	Owner of Tevhid Bilişim, Şanlıurfa
30 July 2015	10 rocket altimeters	USD 380	US supplier of kit for amateur rocket enthusiasts (California)	Advance Technology Global Ltd	PayPal account registered to David Soren, fictitious director of Advance Technology Global Ltd	The brother of the owner of Tevhid Bilişim, Şanlıurfa

Sources: USDC Maryland (2016; 2017); email correspondence between 'David Soren' and a Canadian specialist electronics supplier, obtained from a confidential source, on file with CAR; CAR interview and email correspondence with a German supplier, April 2020; CAR email correspondence with a US surveillance equipment supplier, 28 June 2019

A letter from the Russian government sent to the United Nations Security Council in 2016 also alleged that two individuals with the same names, and Tevhid Bilişim (incorrectly listed as 'Tevhid Bilişim Merkezi') were involved in procuring chemical precursors for IS forces. The evidence presented in this CAR report is the first public corroboration of these allegations, although CAR has found no evidence to substantiate the Russian government's allegation that Turkish authorities were complicit in these supplies (Churkin, 2016).

CAR has established that in July 2015, the owner of Tevhid Bilişim, two of his brothers, and four other men, were arrested following four months of police surveillance, and charged with membership of an armed terrorist organisation, and possessing and exchanging unauthorised dangerous substances. Turkish court records indicate that these seven arrested men were the subjects of a criminal trial that began on 10 February 2016 (Ağır Ceza Mahkemesi, 2020).

The brother of Tevhid Bilişim's owner confirmed to CAR that he was imprisoned and released after 17 months, which he alleged to CAR was due to his being able to furnish exonerating records of sale and lists of clients. He also confirmed that his brother had registered the company, and that he and his two brothers were responsible for running it. However, he stated that Tevhid Bilişim had never sold goods to IS forces' representatives; had no specific recollections of the aluminium paste or component transactions; and had no knowledge of or dealings with Sujan, Ibacstel, or Advance Global Technology. He also insisted that he had only ever sold goods to other Turkish customers, not to Syrian customers; and suggested that other unidentified individuals may have purchased goods for transfer over the border on behalf of Tevhid Bilişim. When asked specifically about the attempted delivery of the altimeters to him by name, he stated that the date of this attempted delivery (after 30 July 2015) was during his detention, which began around 21 July 2015.[12]

Tevhid Bilişim was dissolved on 21 October 2019 (TOBB, n.d.). On 18 November 2019, the US Treasury sanctioned two individuals with the same names as the owner of Tevhid Bilişim and his relative, detailed above, as well as an associated company, ACL İthalat İhracat. The US Treasury alleged that these individuals and ACL İthalat İhracat had 'supplied ISIS with equipment in 2015 and 2017' and acted 'as an ISIS procurement agent' (US Treasury, 2019;

▼ **Captured IED components in the custody of Iraqi security forces in Al Arij, south of Mosul, Iraq, March 2017.**

see Box 1). Evidence that CAR has gathered suggests that the individuals listed for sanctioning are not the same as those who operated Tevhid Bilişim but are instead a cousin and an uncle with the same names, who were not involved with Tevhid Bilişim (see Box 1). The US government has not, at the time of writing, sanctioned Tevhid Bilişim (see Figure 4).

The US Air Force claims that a US-led coalition airstrike killed Siful Haque Sujan in Raqqa on 10 December 2015 (DOD News, 2015). Sujan's brother, meanwhile, was arrested in Spain on 22 September 2017. On 27 April 2020 he was found guilty of sending money to an IS-aligned individual in the United States for the purposes of preparing a terrorist attack (Dolz, 2020).

BOX 1 — **SANCTION DESIGNATIONS OF INDIVIDUALS AND COMPANIES LINKED TO TEVHID BILIŞIM**

Identifying information provided in the US Treasury's sanction designations for the two 'owners' of ACL İthalat İhracat (also sanctioned) is at variance with information CAR has obtained about the individuals with the same names who operated the Tevhid Bilişim company and were linked to Siful Haque Sujan's procurement activities (US Treasury, 2019). CAR believes that related individuals with the same names may be operating in similar business sectors in Şanlıurfa (TOBB, n.d.).[13]

- The US Treasury lists the date of birth of Sanctioned Person 1 as 1 October 1989 and his ID number as 4386794904 (US Treasury, 2019). Turkish company records, census records and CAR interviews confirm that an individual with the same name, born on 1 October 1989 with MERNIS ID number 43867949044, owns ACL İthalat İhracat (TOBB, n.d.).[14] (The US Treasury designation omits the last digit of the 11-digit MERNIS ID number.)

- The US Treasury states that Sanctioned Person 2 was born in 1971 and is the brother of Sanctioned Person 1 (born 1989). Sanctioned Person 1 (born 1989) has confirmed to CAR that he has a brother with the same name as Sanctioned Person 2, but that this brother was not born in 1971. Rather, his uncle, also with the same name as Sanctioned Person 2, was born in 1971. Identity and census documents confirm these relationships and birthdates (see Figure 4).

- Census records indicate that Sanctioned Person 1 (born 1989) has an uncle with the same name as him (born in 1964), and another uncle with the same name as Sanctioned Person 2 (born in 1971). He also has a cousin with the same name as Sanctioned Person (born in 1989) (see Figure 4).[15]

- The US Treasury also gives an alternative date of birth for Sanctioned Person 1: 21 November 1980. Identity documents obtained by CAR indicate that this is the birthdate of a different individual with the same name: the one who owned and operated Tevhid Bilişim along with his brother (who shares the same name as Sanctioned Person 2). This pair of brothers are the cousins of Sanctioned Person 1, and the nephews of Sanctioned Person 2.[16]

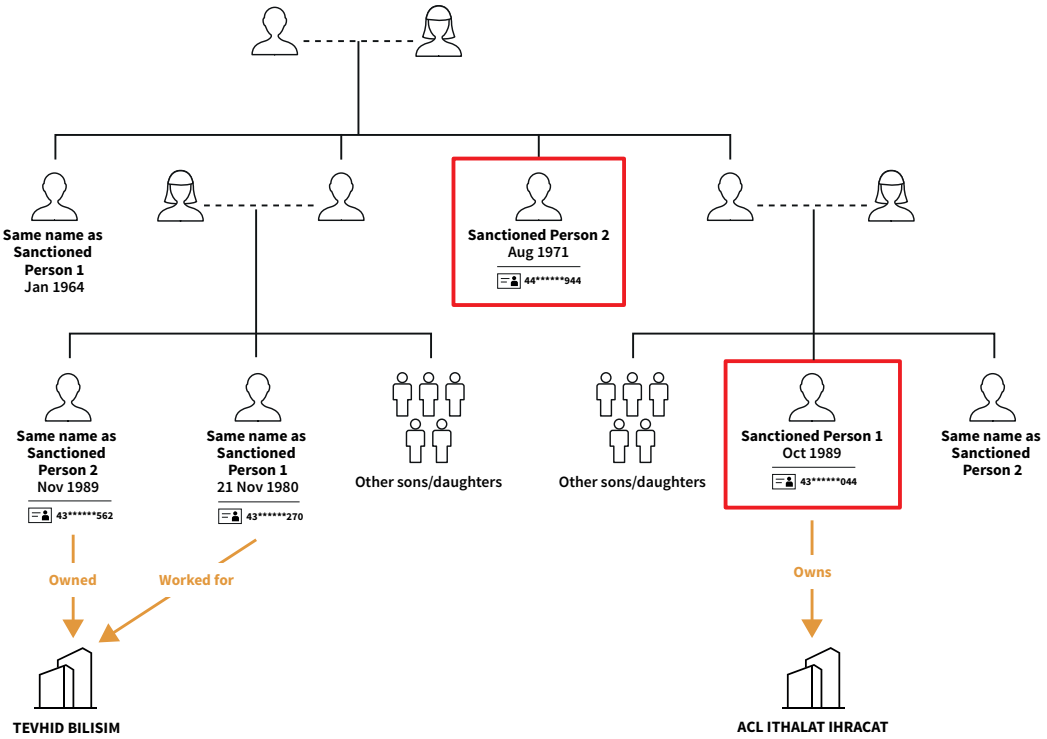
Sanctioned Person 1 (born 1989) has stated to CAR that he and his company, ACL, were victims of mistaken identity; and that the company responsible for helping IS forces was not ACL, but the (currently unsanctioned) Tevhid Bilişim.[17] In July 2019, shortly prior to being sanctioned, Sanctioned Person 1 changed his surname by court order to avoid being confused with his previously imprisoned cousin of the same name who operated Tevhid Bilişim (TOBB, n.d.).

CAR has no knowledge of the activities of the sanctioned company ACL but has found no involvement of Sanctioned Person 1 and Sanctioned Person 2 in the activities of Tevhid Bilişim, the company that CAR has established was connected to IS procurement. Turkish police also questioned Sanctioned Person 1 in June 2018 on suspicion of membership of IS forces, but a decision letter issued by the Şanlıurfa prosecutor confirms that they found no evidence of such membership or grounds for prosecution.[18]

BOX 1 — SANCTION DESIGNATIONS OF INDIVIDUALS AND COMPANIES LINKED TO TEVHID BILIŞIM (CONTINUED)

Figure 4

Family and companies according to Turkish census records and identity documents obtained by CAR



Key

= sanctioned by US Treasury

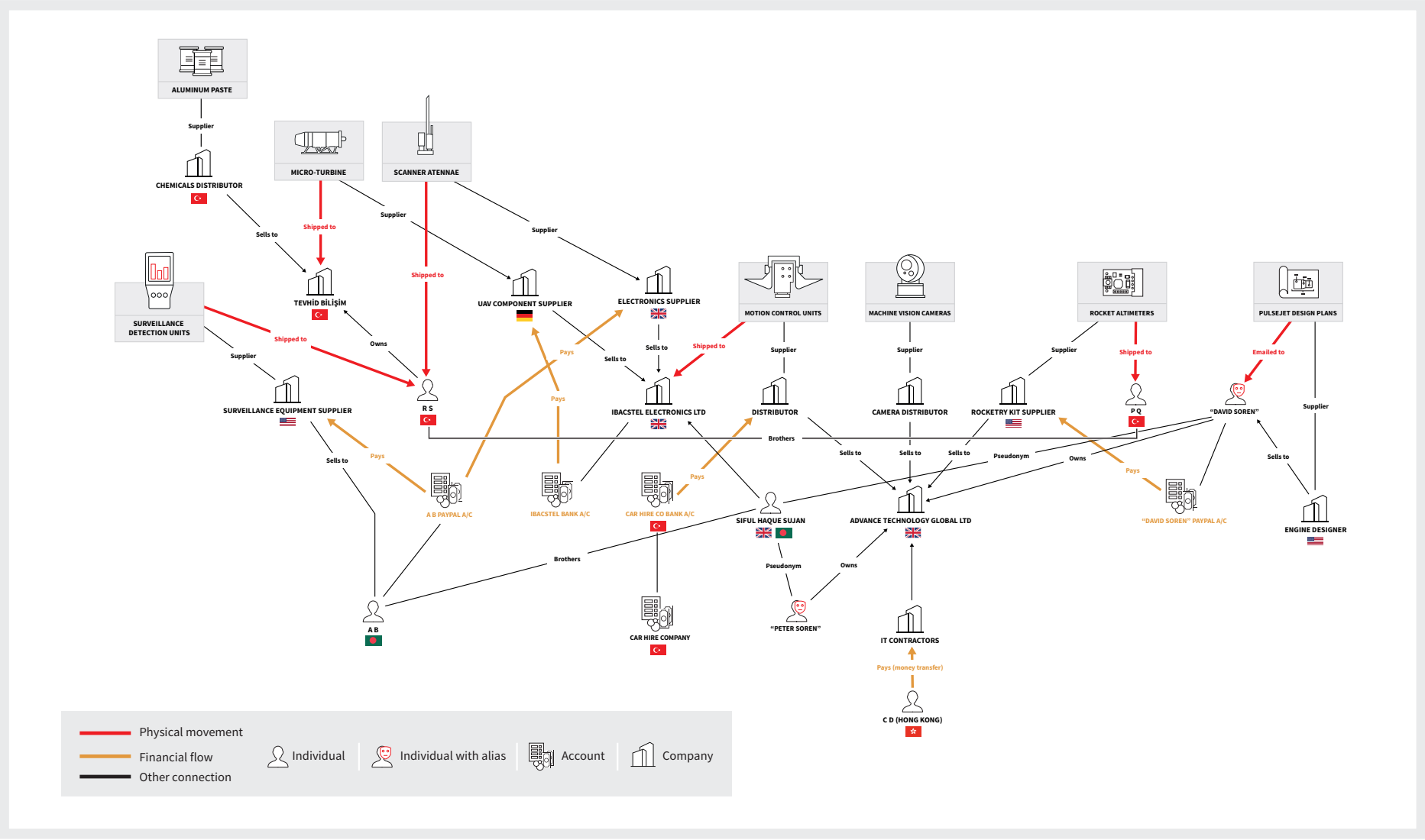
US Treasury designations and listed identifiers

- Sanctioned Person 1, date of birth 1 October 1989, ID number 4386794904; alternative date of birth 21 November 1980; 'chairman of the board of directors' of ACL İthalat İhracat;
- Sanctioned Person 2, dob 1971, 'brother' of Sanctioned Person 1, dob 1 October 1989.

Sources: US Treasury, 2019; TOBB, n.d.; census records and identity documents obtained by CAR.

Figure 5

Network diagram of electronics and leafing aluminium paste procurement



Note: Flags indicate the nationality of an individual, the country of registration of a company or the country of manufacture of goods.

Note: Note: Some individuals have been ascribed random initials in order to anonymise them. Some companies have also been anonymised either for legal reasons or to avoid prejudicing possible future investigations.

▲ IED main charges filled with HME, prior to their disposal, outside Tuz Khurmatu, Iraq, September 2016.

2.2 FERTILISER AND SORBITOL

CAR investigations have identified a second family grouping connected to the supply chain for ammonium nitrate fertiliser and sorbitol which IS forces in Iraq used to produce HME and rocket propellant, respectively.

CAR has no evidence that this second family grouping, or the companies they own, knowingly supplied IS forces; were complicit in trafficking goods across the Turkish–Syrian border; or engaged in any other wrongdoing. Nevertheless, their position (however unwitting) in IS procurement chains underlines how tight family groupings have been central to the cross-border trade that IS forces exploited to sustain military production.

Widely publicised photographs taken at the Akçakale border gate on 27 April 2015, which CAR has verified through interviews and geolocation, show local porters transporting several hundred sacks of Vitagro 33 per cent (high-nitrate) ammonium nitrate fertiliser from the Turkish side of the border to the then IS-controlled town of Tal Abyad on the Syrian side of the border (Hubbard and Shoumali, 2015).[19] Journalists witnessed these transfers on two different days within the same week and interviewed local residents, who claimed that such cross-border movements of ammonium nitrate fertiliser had been taking place for several months (Hubbard and Shoumali, 2015). More detailed photographs of the loading operation show that the fertiliser sacks bore lot numbers that were close in sequence (15029, 15033, 15034). Given the reported scale of the operation, these are unlikely to have been the only lots transferred into Syria.[20]

At the time, Turkish authorities in Şanlıurfa told journalists that Syrian nationals who were returning from Turkey to Syria through the Akçakale border gate could cross with 30–40 sacks of low-nitrate fertiliser (Hubbard and Shoumali, 2015). While low-nitrate fertiliser can be used in the production of HME after significant processing, high-nitrate fertiliser is much easier to use in HME production (hence its prohibition in a number of countries).

Following media reports of the cross-border movement of high-nitrate fertiliser, local authorities in Akçakale reportedly closed the border gate to these goods (Hubbard and Shoumali, 2016).[21] However, the Akçakale border gate may not have been the only crossing point employed by IS forces' procurement networks in Turkey. CAR has obtained photographs taken in April 2015 that show unidentified men on the banks of the Al Balikh river, engaged in the recovery of gas canisters and drums of various chemical products, wrapped in plastic and in some cases buoyed by rubber rings. The chemical products include nitrocellulose from the same Southeast Asian manufacturer as nitrocellulose that CAR field teams documented in Al Qaim, Iraq, in January

PHOTOGRAPHS TAKEN IN APRIL 2015 SHOW UNIDENTIFIED MEN ON THE BANKS OF THE AL BALIKH RIVER, RECOVERING GAS CANISTERS AND DRUMS OF VARIOUS CHEMICAL PRODUCTS.

2018; and leafing aluminium paste from the same manufacturer and distributor as those discussed in Section 2.1 above. The river lies to the south of the Turkish–Syrian border, approximately 4 km east of the Akçakale border gate. The images suggest that, while large-scale smuggling efforts were under way at the Akçakale border gate up to April 2015, smugglers may also have used the area's waterways to transport explosive precursors across the Turkish–Syrian border.[22]

The above-mentioned IS Border Crossing Security Department report supports the claim that the trafficked fertiliser was destined for IS forces. The report describes how Turkish authorities closed the Akçakale border gate to a 125-tonne fertiliser shipment destined for IS forces, which had pre-arranged transport with local smugglers, after 'American journalists' photographed the fertiliser on the Turkish side (IS BCSD, 2015).

On 10 October 2015, Turkey introduced additional requirements for distributors of high-nitrate fertiliser (fertiliser with a nitrogen content of 33 per cent or more). They included enhanced purchaser identification and, for distributors, a requirement to submit sales records to district and provincial authorities on a regular basis (*Resmî Gazete*, 2015). In June 2016, following a series of car bombings in Turkey, the Turkish government suspended the domestic sale of high-nitrate fertiliser altogether (*Daily Sabah*, 2016).

In June 2015, IS forces released propaganda images that purported to show an IS-operated HME production facility in Fallujah, Iraq. The images show sacks of Vitagro 33 per cent ammonium nitrate (AN 33) fertiliser being used in the production process. These sacks are of the same type as those transported across the Akçakale border gate (see Figure 6).[23]

In February 2016, Iraqi Police Emergency Response Units seized sacks of the same type alongside IED components, which the units recovered from IS forces in Ramadi, Iraq. A CAR field investigation team documented these sacks on 21 February 2016 (see Figure 7). Two of the sacks documented in Ramadi bore the lot numbers 15006 and 15021. These lot numbers are close in sequence to those of the sacks photographed at the Akçakale border gate in April 2015.

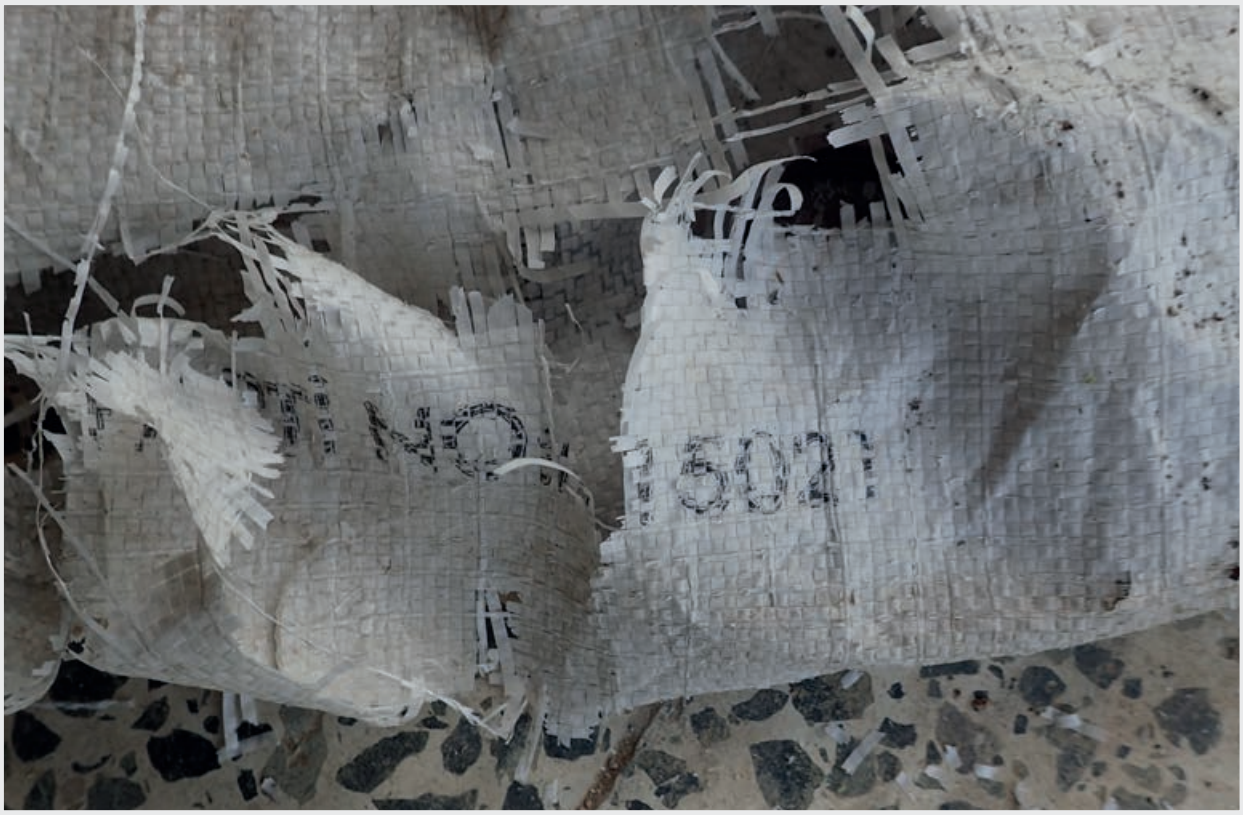
Figure 6

IS forces' propaganda images purportedly showing an HME production facility in Fallujah, Iraq, 2015

Source: Arrhazie Media (2015)

Figure 7

Sack of Vitagro ammonium nitrate fertiliser, documented by a CAR field investigation team in Ramadi, Iraq, 21 February 2016



SALES OF AN 33 TO CLIENTS IN ŞANLIURFA PROVINCE SURGED IN APRIL 2015, THE MONTH OF THE AKÇAKALE CROSS-BORDER TRANSFERS.

CAR has been unable to confirm definitively whether the Vitagro AN 33 sacks that its field investigation team documented in Ramadi in 2016 were among those transported through the Akçakale border gate in April 2015. The manufacturer's extant sales records do not identify fertiliser sales by individual lot, which prevents CAR from tracing sales (and their recipients) to the specific lots documented in Ramadi.[24]

Nonetheless, the distributor's sales records do reveal some significant sales patterns. Interviews with company representatives—and analysis of records of more than 2,800 sales transactions—indicate that sales of Vitagro AN 33 to clients in Şanlıurfa province surged in April 2015, the month of the Akçakale cross-border transfers described above (see Figure 8 and Table 3).[25]

At the time of these transfers, Vitagro was a new supplier in the Turkish market. The company was part of a large, Ukrainian-owned commercial group, which established itself in Turkey in 2014 and began sales in February 2015, shipping fertiliser to Turkey from Ukraine. Vitagro became dormant in 2017 and commenced liquidation in Turkey in December 2018 (TOBB, n.d.).

Of the 16 purchasers of Vitagro AN 33 fertiliser in Şanlıurfa province, one buyer, Company I in Table 3 below, accounts for almost the entire surge in sales in April 2015. Company I was also by far the biggest buyer of Vitagro AN 33 fertiliser in Şanlıurfa province, receiving invoices from Vitagro almost every other day during April. On 29 May 2015, its purchases ended.[26]

Only one other company, Company III purchased 125 tonnes or more of AN 33 fertiliser from Vitagro prior to 27 April 2015, when journalists photographed the Akçakale cross-border fertiliser transfers (see Table 3). Company III also stopped purchasing from Vitagro in mid-2015, making no purchases after 9 June 2015.

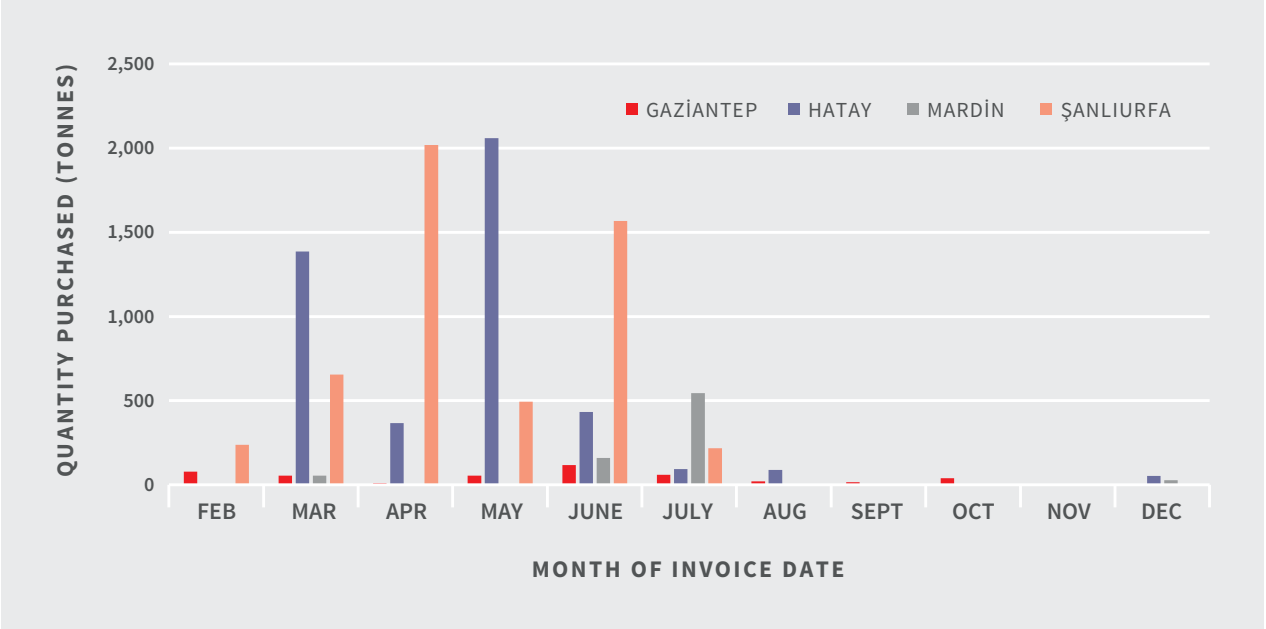
Two possible purchasing scenarios thus emerge. The first is that a buyer based outside Şanlıurfa province shipped the Vitagro AN 33 fertiliser to Akçakale before it was transported across the Akçakale border gate in April 2015. The second is that the 125-tonne shipment described in the IS report, which appears to correspond to the April 2015 transport, derived from the stocks purchased by either Company I, Company III, or both.[27]

There is no suggestion that either of these companies was aware of, or complicit in, the diversion of their products to IS forces, or that either is responsible for any other wrongdoing. The co-owners of Company I state that their company has made no sales of AN fertiliser to customers in Iraq or Syria; that their sales of AN 33 stopped in late 2015 due to the changes in Turkish government regulations governing its sale; that since the 1990s they have notified all their fertiliser sales to the Turkish Ministry of Agriculture; but that they were unable to identify sales and customers for 2015.[28] Likewise the co-owner of Company III states that they have no links to Islamic State forces, that they sell fertiliser products only in Turkey, but that they have not retained sales records for the period in question to determine the onward sale of their Vitagro AN 33 purchases.[29]

▼ **Commercial detonators and other components for the production of IEDs, captured from the Islamic State in Mosul, Iraq, May 2017.**

Figure 8

Purchases of Vitagro 33 per cent ammonium nitrate fertiliser, by province, 2015



Source: Distributor sales records, 2015, on file with CAR.

Table 3

Purchases of Vitagro 33 per cent ammonium nitrate fertiliser in Şanlıurfa province, by buyer and by weight, 2015

	Quantity purchased (tonnes) by invoice date							
Buyer company	**February**	**March**	**April**	**May**	**June**	**July**	**October**	**Total (tonnes)**
I		468	1,842	224				**2,534**
II				54	539	109		**702**
III	188	108		54	27			**377**
IV					322			**322**
V					189	27		**216**
VI				54	133	27		**214**
VII	50	26	26				26	**128**
VIII			125 (29 April) [30]					**125**
IX					108			**108**
X				27	73			**100**
XI					95			**95**
XII				27	54			**81**
XIII		26		54				**80**
XIV						54		**54**
XV					27			**27**
XVI		27						**27**

Source: Distributor sales records, 2015, on file with CAR.

Company I is a large fertiliser producer and distributor based in Şanlıurfa city, approximately 20 km north of the Akçakale border gate. It is owned by members of a family who live in Siverek, around 50 km north-east of Şanlıurfa city (see Map 1). Until 2018, two brothers owned the company. In 2018, following the death of one of the brothers, the company's ownership passed to two of his sons (TOBB, n.d.).[31]

Company III is a smaller agricultural retailer located in Siverek. After Company I, Company III was the most significant purchaser of Vitagro AN 33 fertiliser in Şanlıurfa province prior to May 2015 (see Table 3). Two brothers also own Company III (TOBB, n.d.). They are cousins of the two sons who currently own Company I.[32]

CAR has no evidence to suggest that either company was complicit in the trafficking of Vitagro AN 33 fertiliser across the Akçakale border gate, nor that either company had any involvement with IS forces. However, Company I does appear to have a connection to the purchase of another commodity obtained by IS forces (Figure 10).

On 31 August 2015, an individual with the same name and registered address as one of the owners of Company I paid USD 55,800 from his bank account for the purchase of a large shipment of French-manufactured sorbitol from the Turkish food and pharmaceutical distributor Sinerji Gıda Kimya Tekstil.[33] He made these payments on behalf of Ale Cemal Elsavi, a Syrian company based in Aleppo. Ten days earlier, on 20 August 2015, another individual based in Akçakale paid USD 28,500 from his bank account to the same distributor, Sinerji Gıda Kimya Tekstil, for sorbitol, also on behalf of Ale Cemal Elsavi. Then, in December 2015 and January 2016, this second, Akçakale-based individual made two payments totalling USD 114,000 to a company named Ali Salah Edin Muhyiy for sorbitol shipments.[34] Both this Akçakale-based individual and the owner of Company I who co-financed these shipments deny knowing each other; as does the co-owner of Company III.[35] Social media records indicate that this Akçakale-based individual is a social media acquaintance of the co-owner of Company III, the chairman of the board of Company I, and other members of this extended family.[36]

Ale Cemal Elsavi and Ali Salah Edin Muhyiy are sister companies based in Aleppo, Syria.[37] At the time of the payments, Aleppo was under siege by various Syrian opposition groups and Syrian government forces.

CAR field investigation teams documented more than 100 sacks of sorbitol in captured IS forces' weapon production facilities in Qaraqosh and around Mosul, Iraq, between November 2016 and May 2017 (CAR, 2017b, pp. 115–19; see Figure 9). IS forces used the sorbitol as a fuel component in the production of rocket propellant (CAR, 2016c).

▼ **A room in Mosul, Iraq, used by Islamic State forces to store weapons and chemical precursors, May 2017.**

Figure 9

Sack of Tereos sorbitol documented by a CAR field investigation team in Gogjali near Mosul, Iraq, in November 2016

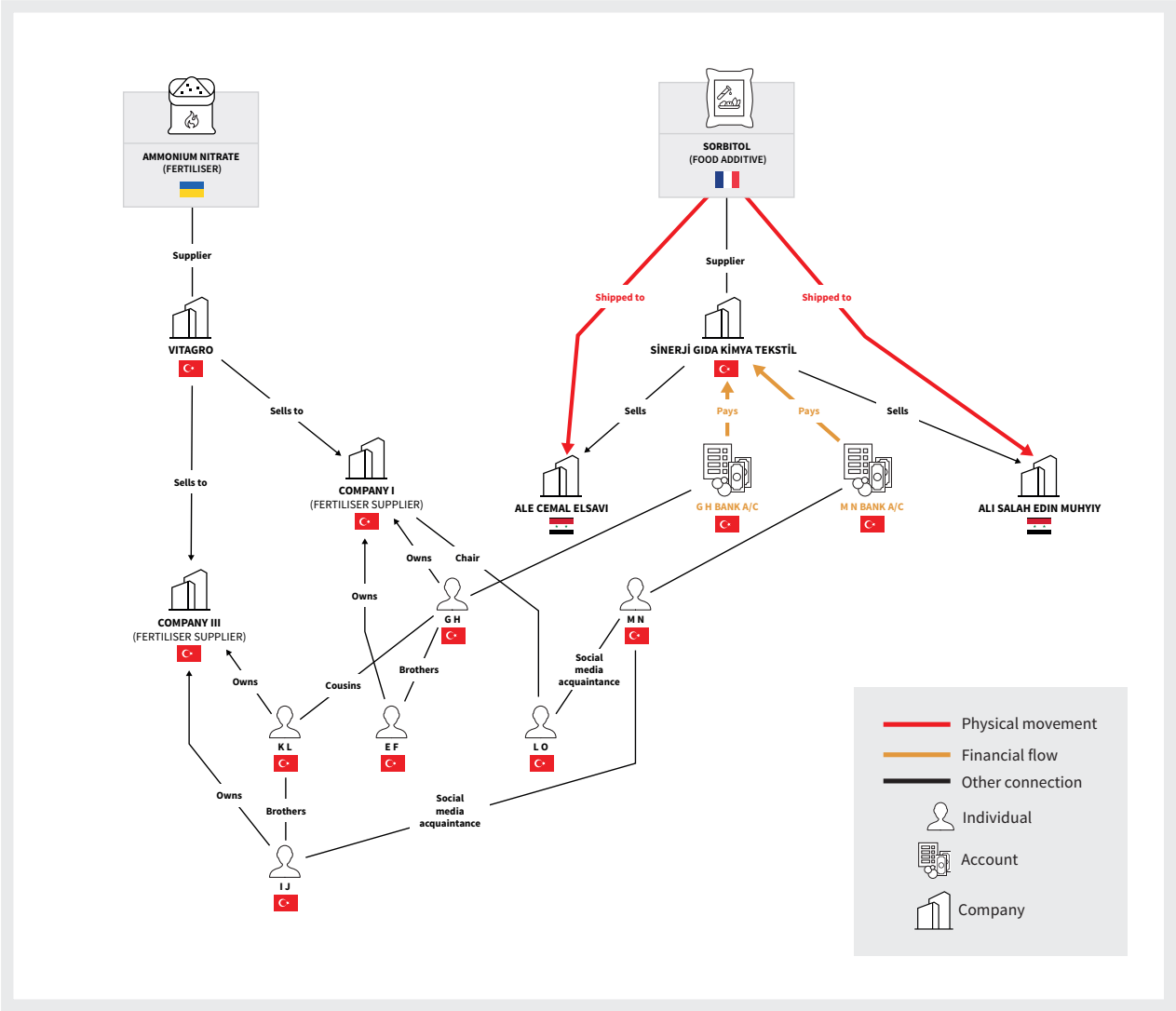
Based on lot numbers provided by CAR, Sinerji Gıda Kimya Tekstil confirmed that the sorbitol documented in Qaraqosh and Mosul was from the two shipments financed from Turkey, mentioned above. Sinerji Gıda Kimya Tekstil also stated that it delivered the two shipments—on 1 September 2015 and 22 December 2015, respectively—to Turkey's Öncüpınar border crossing with Syria. The crossing lies to the north of Aleppo and some 160 km west of Akçakale.[38] (There is no suggestion that either the French manufacturer or the Turkish distributor had any knowledge that their products were destined to IS forces, or engaged in any other wrongdoing.)

Combined, the two shipments were conspicuously large in comparison to previous sorbitol trade deals between Turkey and Syria. They constituted around 40 per cent of all registered Turkish sorbitol exports to Syria in 2015—a trade that itself had greatly increased, from around 16.5 tonnes in 2014 to nearly 187 tonnes in 2015 (CAR, 2017b, pp. 116–17).

It is not clear why two individuals who were based near the border crossing at Akçakale paid for goods that were to be shipped through a border crossing 160 km away. Nor is there an obvious explanation for why the co-owner of Company I, an individual involved in the fertiliser and agricultural products business, paid for large shipments of food additives. The co-owner of Company I told CAR that he had no knowledge of any of these transactions, and had never dealt in sorbitol. The Akçakale-based individual who co-financed these shipments confirmed to CAR that he had purchased sorbitol on behalf of the Syrian companies on several occasions, but stated that he had no knowledge of its intended use, could not recall how he came into contact with these companies, and could not remember the names of the individual company representatives with whom he did business.

Figure 10

Network diagram of fertiliser and sorbitol purchasers and shipments



▼ **A damaged storage room next to an Islamic State mortar position, Mosul, Iraq, May 2017.**

3. TECHNOLOGY AND EXPERTISE FOR NEW IMPROVISED WEAPON SYSTEMS

The chemical and component supply chains described in Section 2 posed diversion risks for suppliers of common industrial products. IS forces' efforts to develop new improvised weapon systems, both offensive and defensive, also posed risks for suppliers of higher-technology products and expert technical services. Most of these weapon systems have yet to be observed in the field or described in publicly available literature.

Nonetheless, IS forces' weapon specialists acquired expertise; designed systems and software by engaging unwitting suppliers; and built functional prototypes using materials and components procured in part through the networks described above. In contrast to the personal, local procurement arrangements of the family-based groupings discussed above, in these cases IS weapon designers sought to exploit global and online marketplaces for hardware and expertise.

3.1 ATTEMPTS TO CONSTRUCT PULSEJET-POWERED UAVS

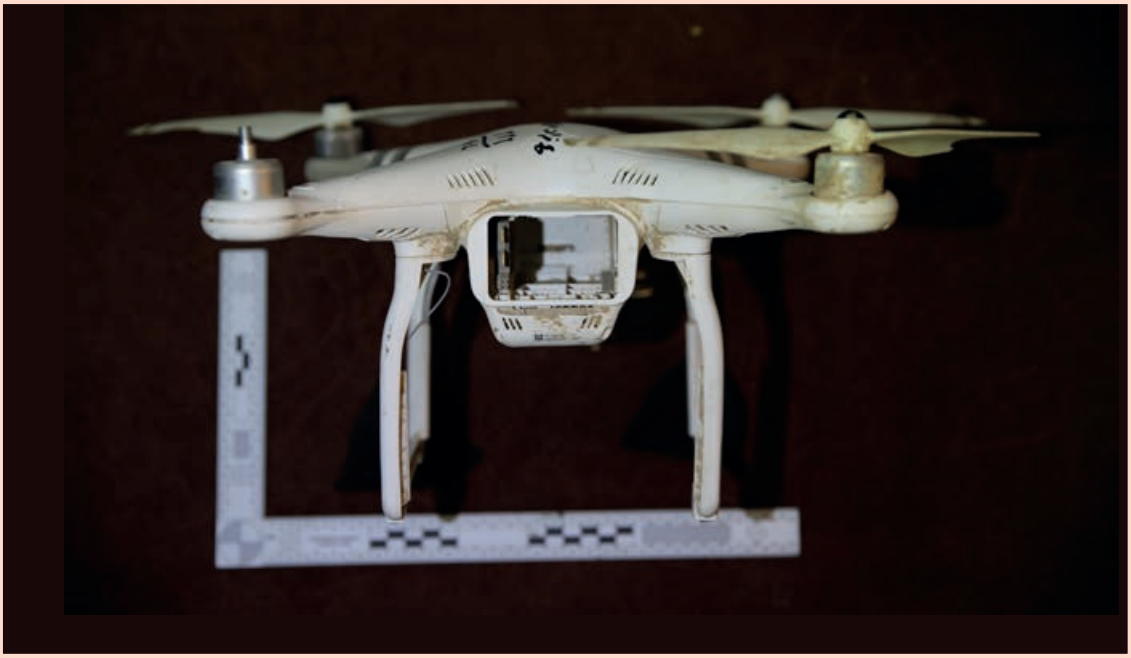
IS forces' use of UAVs in Iraq and Syria from 2016 onwards focused heavily on small, electrically powered rotary-wing aircraft, which are commercially available worldwide. A series of Chinese-manufactured quadcopters dominate the sample of UAVs that CAR has documented in Iraq and Syria.[39] CAR field investigation teams documented 28 quadcopter UAVs of this type, which Iraqi defence and security units had recovered during operations against IS forces between December 2016 and September 2019 (Figure 11).[40] IS technicians customised some of these quadcopter UAVs so that they could drop modified items of conventional ammunition or IEDs onto ground targets (CAR, 2017a; see Box 2).

▼ **A workshop for fabricating rockets recaptured from Islamic State forces in Hawija, Iraq, November 2017.**

BOX 2 — **QUADCOPTER UAVS**

Figure 11

A quadcopter UAV documented by a CAR field investigation team at a storage facility in Baghdad, Iraq, on 18 September 2019



CAR tracing indicates that retail purchasers in diverse locations bought many of these quadcopters—in contrast to the few bulk buyers who ordered chemical precursors and components directly from regional distributors, as described in Section 2. Procurement of such UAVs may have been more geographically dispersed due to their widespread retail availability as well as their high cost per unit, as bulk purchases would have required large, formal (and traceable) wire transfers.[41]

CAR traced seven quadcopters recovered from IS forces in Iraq to independent distributors in Kuwait (2 units), Lebanon, Singapore (2 units), Turkey, and Uzbekistan (see Figure 12). CAR has traced some of these quadcopters to onward sales in Iraq and the United Arab Emirates (UAE), but how they subsequently reached IS forces remains unclear.

In November 2015, the Lebanese distributor Vatech SARL sold one of these quadcopters to Raiya Group, an Iraqi IT company based in Baghdad, as part of five consignments of 21 rotary-wing UAVs made between August 2015 and March 2016, according to Vatech sales records. Raiya Group denies purchasing these or other UAVs.[42] (On 5 November 2015, the US Treasury placed Vatech SARL and its chief executive officer (CEO) on its list of Specially Designated Nationals, alleging that Vatech had acted as a 'Hizballah procurement agent' and had 'purchased unmanned aerial vehicles (UAVs) and accessories, and various electronic equipment from companies in United States, Europe, Asia, and the Middle East' (US Treasury, 2015). Vatech SARL's CEO has strongly denied having any connection to Hezbollah, and CAR has no evidence the activities alleged by the US Treasury were connected to IS UAV procurement (Topouzoglou and Rose, 2016)).

A Singapore-based distributor originally sold two other quadcopters documented in Iraq. In August 2016, this distributor sold one of these quadcopters as part of a sale of 150 quadcopters to CMMV International Trading FZE, a company based in Dubai, UAE.

BOX 2 — **QUADCOPTER UAVS** (CONTINUED)

Figure 12

Sales of seven quadcopter UAVs captured in Iraq

Distributor Location	Retailer	Purchaser
Kuwait	?	?
	?	?
Lebanon	Raiya Group (Iraq)	?
Singapore	?	?
	CMMV International Trading FZE (UAE)	Individual retail customers at Dubai shop (Dufri Gulf General Trading LLC)
Turkey	?	?
Uzbekistan	?	?

Key Shipper · Distributors · Known retailers · Location of quadcopters recovered by Iraqi security forces

CMMV International Trading FZE informed CAR that it sold all of their quadcopter UAVs individually to cash-paying retail customers via Dufri Gulf General Trading LLC, a small electronics shop it owned in a side street in the Deira district of Dubai. CMMV stated that, at that time, it did not maintain records of UAV customers or of the UAV serial numbers that customers had purchased.[43]

This kind of retail trade appears to have involved large numbers of UAVs. The Singapore-based distributor claimed that it sold around 100 quadcopters per month to CMMV International Trading FZE in Dubai during a period of peak demand in late 2015 and 2016, and that this trading volume declined thereafter.[44]

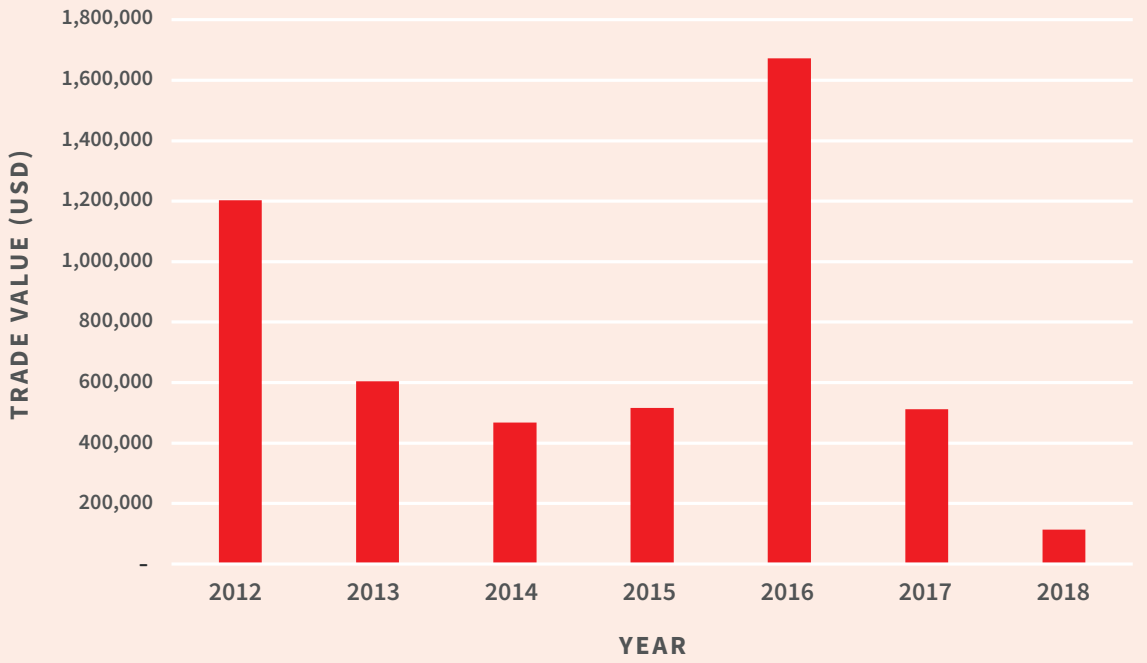
With the exception of the August 2016 shipment, CAR has been unable to confirm these sales volumes directly. However, customs statistics for the goods code used for shipments of quadcopters to the UAE retailer indicate a significant 2016 spike in imports to the UAE declared under this commodity code (COMTRADE, n.d.; see Figure 13).[45]

Notably, the Chinese manufacturer listed the quadcopter UAVs it shipped directly from Hong Kong to CMMV International Trading FZE as 'digital cameras' on shipping documentation.[46] This categorisation may make it more difficult to track international UAV shipments through customs data. In May 2017, the UAE introduced new requirements for the individual registration of UAVs purchased or operated for recreational or commercial purposes within the country (WAM, 2017).

BOX 2 — **QUADCOPTER UAVS** (CONTINUED)

Figure 13

UAE-declared imports of goods from Hong Kong under Harmonized System (HS) code 950300 (locomotive toys)



Note: Since this HS code covers other commodities and other exporters and importers, the 2016 increase cannot wholly be ascribed either to CMMV International Trading FZE or to quadcopter UAVs.

Source: Source: UN Comtrade (n.d.)

CAR's investigations have determined that, from at least 2015, IS technicians also sought to develop larger, faster UAVs powered by pulsejet engines. Pulsejets are a type of acoustic jet engine originally developed for World War II-era V1 'flying bomb' cruise missiles (Charchidi, 2017). Pulsejet engines fell out of use for full-scale aircraft in the 1950s, following rapid advances in turbojet engine designs. They remain an inexpensive and technically unsophisticated jet engine, which some amateur model aircraft enthusiasts use to construct jet-powered model aircraft capable of speeds of 250 km/hr and more (Everman, 2007). Such aircraft generally feature small engines, which measure around 0.5 m in length and produce thrust of around 13–22 N (3–5 lbs).[47]

In August 2015, an individual posing as 'David Soren' of Advance Technology Global Ltd (see Section 2.1 above) made an online purchase of plans for a much larger, valved pulsejet engine capable of approximately 222 N (50 lbs) of thrust. He placed the order with a US company serving advanced hobbyists and emailed the company's owner to ask whether the engine could be used to power a 40-kg model airplane.[48]

In September 2017, an unexploded ordnance and IED clearance operation at the Al Shifa hospital complex in west Mosul, Iraq, found a fully constructed pulsejet engine. The engine measured more than 2 metres in length and featured a machined air-intake head, and a motorbike spark plug for ignition.[49] During their occupation of Mosul, IS forces had used the Al Shifa complex as a weapon and ammunition storage site, and as a production facility for airborne IEDs and a range of other weapons and ammunition (Robin, 2018).

The recovered pulsejet in Mosul suggests that, in addition to the plans that 'David Soren' purchased, IS forces' UAV designers obtained jet engine expertise from other sources that have yet to be identified. The design of the Mosul pulsejet differs somewhat from the plans that 'David Soren' purchased; in particular, its intake uses a 'daisy-valve' arrangement, while the purchased plans incorporated a more complex rectangular valve grid (see Figure 14).[50] The absence of an accompanying fuel system for the Mosul pulsejet makes it difficult to make further technical comparisons. Designs for 'daisy-valve' pulsejets are available from several online sources, as well as specialist suppliers in the United States and Europe.

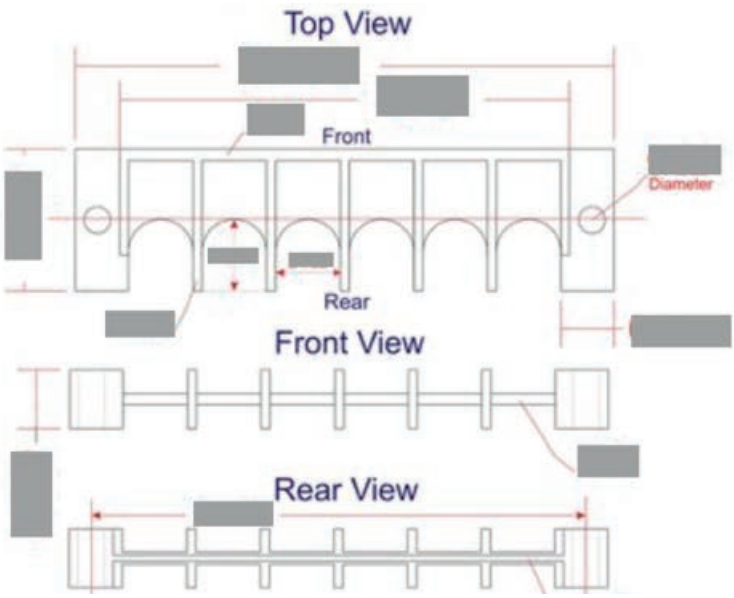
Figure 14

Pulsejet engines

Top-Left: Pulsejet engine found at Al Shifa hospital, Mosul, September 2017.

Top-Right: Close-up of air intake of pulsejet engine from Al Shifa.

Bottom: Air intake details from plans purchased by 'David Soren' (pseudonym of Siful Haque Sujan and associates). Note: CAR has redacted the dimensions from the plans.



Sources: Confidential

PULSEJETS ARE A TYPE OF ACOUSTIC JET ENGINE ORIGINALLY DEVELOPED FOR WORLD WAR II-ERA V1 'FLYING BOMB' CRUISE MISSILES.

CAR has yet to document physical evidence of pulsejet-powered UAVs constructed by IS forces, and of the group's successful fielding of a UAV large enough to accommodate the pulsejet found at the Al Shifa complex. Although CAR was unable to examine the pulsejet in detail, its physical condition suggests that IS technicians may have tried but failed to start it: the interior of the tube was sooty but the exterior showed little indication of intense heat effects.[51]

Other field observations point to IS forces' efforts to build much larger UAVs than the commercial off-the-shelf UAVs that were prevalent in their operations in Syria and Iraq. CAR field investigators documented a range of UAV components in IS forces' workshops in Mosul and Ramadi, including plywood and extruded polystyrene foam components for fixed-wing aircraft with a wingspan of more than 3 metres (CAR, 2016b). At the time, CAR found no evidence of propulsion systems in these workshops.

3.2 DEVELOPMENT OF AN AUTOMATED ANTI-AIRCRAFT SYSTEM

CAR's investigations have also determined that during 2015 IS weapon developers sought to design and build an optical aerial tracking system, which they may have envisioned as the basis for an automated anti-aircraft system.

During 2015 a UK-registered front company established by an IS weapon designer entered into contracts with suppliers of machine vision software and hardware, including high-specification cameras and motion control units, based in North America and Asia. One contract stated that the company intended to develop 'an optical system, used to detect flying object [sic], such as weather balloons and record there [sic] locations'. The UK front company expanded this ostensible purpose to the surveillance of 'farmland airspace', for example for monitoring crop-spraying.[52]

The system envisaged using cameras mounted on moving platforms. When the system located a flying object, all the cameras in the system were intended to 'lock on and track that object' physically using heavy-duty pan/tilt motion-control units.[53] This design may have been intended to allow the system to be used to mount weapons as well as cameras.

▼ **Augmentation charges and primary cartridges produced by IS forces, near Al Qaim, Anbar Province, Iraq, March 2018.**

▲ Pressure plates for IEDs stacked in a house in Hawija, Iraq, November 2017.

The front company's representatives were evidently careful to conceal any such military intent, and to conceal their identities:

- Communication with suppliers reportedly took place only over email, third-party websites, and VoIP calls/chat.[54]
- The front company used at least three pseudonymous email addresses. The senders purported to be different employees of the UK front company. At least two of these email addresses operated from Turkish IP addresses.[55]
- The front company paid suppliers primarily via Western Union payments made by an individual in Hong Kong whom CAR has not yet been able to identify.[56] On one occasion, the company had to make a cash payment of USD 18,000 to a North American hardware supplier via a direct bank transfer. A bank transfer may have been necessary because other transfer methods, such as cash transfers or PayPal, would have required verification of the sender's identity in view of the large sum. In this case, the front company representative informed the supplier that the bank transfer would come from one of their companies in the UK or Hong Kong.[57] Yet, several days later, the supplier received a payment from the Turkish bank account of an unrelated company in Istanbul.[58] A Turkish national originally from Nizip (close to the Karkamış border crossing between Turkey and Syria) had registered this company five months earlier, in January 2015, and it has ostensibly operated in Istanbul since 2016 as a luxury car-hire business (TOBB, n.d.).[59] (CAR has no evidence that this company or its owner were aware of IS procurers' involvement in this transaction, or engaged in any wrongdoing).

Though this example indicates the technical ambition and global reach of IS' weapon development efforts, CAR has no evidence that the system was ever completed. CAR understands that some suppliers ended their contracts prematurely after becoming suspicious about the front company's identity and intentions.

COMMUNICATION WITH CONTRACTORS AND SUPPLIERS TOOK PLACE ONLY OVER EMAIL, THIRD-PARTY WEBSITES, AND VOIP CALLS/CHAT.

4. RED FLAGS IN ISLAMIC STATE SUPPLY CHAINS

Cross-border supply chains into areas of Syria outside of government control, including those which supplied explosive precursor chemicals and electronic items used by IS forces, involved the centralised purchase, receipt, and onward transfer of various different commodities by family networks along the Turkish–Syrian border. As a result, product orders and payments exhibited multiple irregularities in the way in which customers presented themselves, the methods they used to pay for products and services, and the 'fit' between customers or payors and the products.

IS forces' efforts to obtain the technology and expertise they required to develop ambitious new weapon systems displayed similar, potentially identifiable irregularities, even if only evident in retrospect.

These irregularities can be characterised as 'red flags' (see Table 4). No single red flag, or combination of red flags, demonstrates illicit activity per se. Taken together, however, they indicate that individuals and companies may be working outside their standard course of business—and thus may be cooperating for purposes other than those of their public-facing commercial businesses.

CAR does not suggest that these purposes were necessarily nefarious. For instance, such groupings may have purchased goods on behalf of other parties as favours within family or friendship groups.[60] Nonetheless, such transactions may be worthy of additional due diligence.

▼ **Materiel captured from Islamic State forces in Hawija, Iraq, November 2017.**

Table 4

Red flags in supply chains detailed in this report

Entity	Red flag	Examples
Client	New or one-time customer	Tevhid Bilişim placed a first and only order for leafing aluminium paste.
	Sensitive location	The purchasers of unusually large quantities of sorbitol were based in Aleppo, Syria, then contested by several armed groups.
	Business type unrelated to purchase	Tevhid Bilişim, a small mobile phone dealer, placed an order for a bulk shipment of leafing aluminium paste.
	Unusually large purchase (especially for new clients)	Tevhid Bilişim ordered six tonnes of leafing aluminium paste (as its first and only order). Two Syrian companies in two 2015 transactions purchased more than four times the total amount of sorbitol exported from Turkey to Syria in the whole of 2014.
	Unexpected changes in job specifications or requests for contractual amendments	The UK front company for an IS weapon developer changed specifications from tracking weather balloons to tracking crop-spraying aircraft.
	No communication by voice or video	The UK front company's representatives communicated with suppliers primarily via email and VoIP chat. (N.B.: Such communication may be normal for suppliers in some sectors.)
Payor	Sensitive location (such as a border with conflict-affected territory)	A Turkish individual made a bank transfer for sorbitol from Akçakale, the border town next to (then IS-held) Tal Abyad.
	Unconnected to client or consignee	The UK front company purchasing optical tracking hardware arranged for a car hire business in Turkey to pay the supplier. Turkish individuals made bank transfers for sorbitol shipments to Syrian companies.
	In a location that differs from the client's or that is unexpected	The company that paid the supplier of optical tracking hardware was located in Turkey, although the client had told the supplier to expect a payment from the UK or Hong Kong.
	Business type unrelated to purchase	A car-hire business made a payment for optical tracking hardware. The co-owner of a fertiliser dealership paid for a bulk order of food additive (sorbitol).
	Use of payment methods with weak identity checks	An IS front company avoided using credit cards or bank transfers, and instead insisted in paying suppliers via international cash transfer (although payment in regular instalments, against specified contract milestones, may be routine in some industries). The company may have targeted suppliers in areas under-served by international banking infrastructure in order to justify the use of cash transfer mechanisms.
Consignee	Unconnected to client or payor	An electronic point-of-sale company in the UK purchased a micro-turbine, surveillance detection kits, and rocket altimeters, but asked the suppliers to ship them to unrelated companies and individuals in Turkey.
	Sensitive location	A micro-turbine, surveillance detection kits, and rocket altimeters were shipped to individuals in a city close to the Turkish–Syrian border crossing and adjacent to IS-controlled territory.
	Business type unrelated to purchase	A micro-turbine and surveillance detection kits were consigned to the address of a small mobile phone dealer, Tevhid Bilişim.
Logistics	Sensitive route	Unusually large sorbitol shipments were delivered to the Öncüpınar border crossing, destined for Aleppo customers (the shipment would have had to pass through IS-controlled territory around Al Bab).

5. CONCLUSION

This report describes how small groups of individuals and companies connected by family ties, particularly in Turkey and the UK, acted as conduits for goods within multiple supply chains which IS forces accessed. These groupings therefore represented particularly vulnerable points in IS forces' procurement networks. Had industry and law enforcement authorities identified these choke points earlier in the conflict, they may have been able to interrupt the conflict-sustaining quantities of materiel acquired by IS forces, particularly during 2015.

Crucially, however, these connected purchasers and consignees were not fully visible to the international producers and suppliers of these goods. In most cases they were only visible to national or regional distributors, one step down the supply chain. Thus, even if major producers or suppliers had shared information globally about suspicious purchases, they may not have been able to identify these family groupings and their interlinkages. 'Red flags' in illicit procurement chains are often visible only at the distributor level, rather than at the manufacturer level.

This is not to blame manufacturers or distributors. On their own, none of the red flags described in Table 4 would decisively have indicated illicit or military-related procurement. Cumulatively, nonetheless, they may indicate the need for suppliers to conduct additional due diligence.

However, the examples in this report demonstrate that IS procurers relied not only on local interpersonal networks. They also used global business platforms for e-commerce and recruitment. While interpersonal trust might be important in the former, IS forces exploited relative anonymity in the latter. Whenever possible, IS procurers made payments in small amounts via PayPal or international money transfer. They used pseudonymous email addresses and messaging handles to communicate with potential suppliers and contractors, who may have been used to working with international clients and relying on email and messaging apps as the primary forms of communication. Some online contracting platforms do not validate buyers or sellers, or necessarily vet job posts, even if they involve military applications. Moreover, in the case of Advance Technology Global Ltd, IS procurers were able to engage with suppliers using a UK front company registered using the names of fictitious directors and shareholders, whose identities the UK company register did not verify.[61]

As well as private-sector due diligence, government customs and trade departments may be able to detect anomalies in aggregate cross-border trade of the kind described in this report for commodities like aluminium paste or sorbitol: particularly if exports or imports of several precursor chemicals spike simultaneously.

Importantly, the supply chains described in this report were not reliant on territorial control or on capturing commercial goods or facilities. Although IS forces may no longer hold territory, remaining IS cells in Iraq and Syria became increasingly active in 2020 (ACLED, 2020). Disrupting their procurement efforts by spotting transactional red flags will therefore remain an important tool against the resurgence of IS forces and their successors.

'RED FLAGS' IN ILLICIT PROCUREMENT CHAINS ARE OFTEN VISIBLE ONLY AT THE DISTRIBUTOR LEVEL, RATHER THAN AT THE MANUFACTURER LEVEL.

ENDNOTES

1 This report does name one private individual, Siful Haque Sujan. The US Department of Defence claimed that US-led coalition forces killed Sujan in an airstrike in Raqqa in December 2015 (DOD News, 2015). Deceased individuals are not covered by UK and EU data protection regulations.

2 Produced by the IS Border Crossing Security Department (أمن المعبر), reportedly a department within the IS Immigration Authority (هَيْئَة الهجرة), the report complains that Turkish authorities closed the border gate, impeding a planned delivery of 125 tonnes of fertiliser by [name 1], and an unnamed 'Turkish smuggler who bought gate access for nearly a month to get the fertilisers through'. The reporting IS security officer states that the IS Department for Equipment (التجهيز) in Raqqa made a deal with 'a civilian (trader) who owns the [redacted] restaurant, and [name 2]' to buy fertiliser at a rate that left the smuggler with insufficient funds to bribe border officials: 'From the very beginning of this business, [name 1] told [name 3]' that if the price of the fertiliser is low, the road route would not be clear because traders of low-priced fertilisers do not pay bribes at the border gate, while higher-price traders do' (IS BCSD, 2015). CAR has so far been unable to identify the real names of the individuals referenced in this document, which CAR has redacted here. See also Hubbard and Shoumali (2016). CAR was not present at the recovery of this document and cannot verify its chain of custody. However, CAR has examined other IS documents that CAR field teams and other researchers documented in Iraq and Syria during 2016–18. The format and orthography of the Border Crossing Security Department report match those of other IS documents.

3 Following its engagement with CAR, the distributor stated that it had introduced batch-level sales tracking. CAR interview with the chemical distributor, June 2019.

4 CAR interview with the chemical distributor, June 2019; sales records reviewed by and on file with CAR.

5 CAR interviews with the chemical distributor, June 2019 and January 2020.

6 For more information on Siful Haque Sujan's activities, see Rassler (2018).

7 CAR interview and email correspondence with the German supplier, April 2020.

8 CAR interview and email correspondence with the German supplier, April 2020.

9 On 18 September 2020, Companies House announced that the UK government would be bringing forward legislation to introduce identity verification of company directors, although not of shareholders or beneficial owners (Companies House, 2020).

10 CAR interviews with two individuals who viewed the Advance Technology Global Ltd website, locations and dates withheld.

11 Email correspondence and online chat messages from Advance Technology Global representatives to suppliers, obtained from two confidential sources, on file with CAR.

12 CAR interview with the brother of the owner of Tevhid Bilişim, October 2020.

13 Population records from the MERNIS National ID database dated 2010, accessed via the C4ADS Seamless Horizons database; CAR telephone interview with Sanctioned Person 1, October 2020.

14 Population records from the MERNIS National ID database dated 2010, accessed via the C4ADS Seamless Horizons database.

15 CAR has the full names and precise birthdates of these individuals but has withheld them here for privacy reasons.

16 Identity and census documents for Sanctioned Person 1, Sanctioned Person 2, and the owners/operators of Tevhid Bilişim, on file with CAR.

17 CAR interview with Sanctioned Person 1, October 2020.

18 Letter from Şanlıurfa prosecutor, on file with CAR.

19 Text message communication between CAR and the photographer, 30 July 2020.

20 Additional photographs of the ammonium nitrate fertiliser transfer operation from a confidential source, on file with CAR.

21 CAR interview with an individual who was in Akçakale during May 2015, May 2019.

22 Photographs obtained from a confidential source, on file with CAR. Geolocation conducted by CAR.

23 Images circulated by IS forces, published on several affiliated or sympathetic websites. See, for example, Arrhazie Media (2015).

24 CAR interview with the distributor, June 2019. On 25 April 2016, Vitagro responded promptly to a formal trace request issued by CAR on 21 April 2016. In its response, the company confirmed that it had manufactured the bag of ammonium nitrate, the subject of CAR's request, and that Vitagro only sells this type of product on the Turkish domestic market. Vitagro further stated that its customers are Turkish fertiliser dealers and distributors and that it has no knowledge as to how Islamic State acquired its product.

25 Distributor sales records from 2015, on file with CAR. CAR telephone interview with fertiliser distributor, August 2019; CAR email correspondence with distributor, August 2019.

26 CAR has anonymised the company names of the purchasers of Vitagro AN 33 fertiliser for privacy reasons, and in order to avoid prejudicing potential future investigations.

27 As shown in Table 3, Company VIII also purchased 125 tonnes of fertiliser from Vitagro in April 2015. While this quantity matches that detailed in the IS Border Crossing Security Department report, sales records that CAR has reviewed indicate that this sale was made on 29 April 2015, after the transfers photographed on 27 April.

28 CAR telephone interview with the co-owner of Company I, 5 October 2020; CAR telephone interview with the second co-owner of Company I, 8 October 2020.

29 CAR telephone interview with the co-owner of Company III, 6 October 2020.

30 As discussed above: Company VIII purchased 125 tonnes of fertiliser from Vitagro in April 2015. While this quantity matches that detailed in the IS Border Crossing Security Department report, sales records that CAR has reviewed indicate that this sale was made on 29 April 2015, after the transfers photographed on 27 April.

31 Population records from the MERNIS National ID database dated 2010, accessed via the C4ADS Seamless Horizons database.

32 Population records from the MERNIS National ID database dated 2010, accessed via the C4ADS Seamless Horizons database.

33 Bank transfer records from a confidential source, on file with CAR; population records from the MERNIS National ID database dated 2010, accessed via the C4ADS Seamless Horizons database; matched to ID number of the Company I shareholder as listed in TOBB (n.d.).

34 Bank transfer records from a confidential source, on file with CAR. CAR has been unable to contact either of these Syrian companies.

35 CAR telephone interview with the individual, October 2020; CAR telephone interview with the co-owner of Company I, October 2020. On 3 November 2020, the co-owner of Company I responded to a formal advance notification issued by CAR on 15 October 2020. This response stated that: 1) the co-owner had no knowledge of, and no involvement in, the subjects described in the advance notification; 2) the co-owner had no knowledge of the individuals mentioned in the advance notification; 3) the lot numbers of ammonium nitrate referenced in the advance notification are not in his company's records; 4) the company only sells to other dealers.

36 Social media records reviewed by CAR.

37 On 15 August 2017, Sinerji Gıda Kimya Tekstil responded to a formal trace request issued by CAR on 12 July 2017. This response confirms that: 1) Sinerji Gıda Kimya Tekstil exported 18,000 kg of sorbitol with batch number F20193601, subject to CAR's trace request, to the Ali Salah Edin Muhyiy company (a sister company to Ale Cemal Elsavi), Aleppo, Syria, under an export declaration dated 22 December 2015; 2) Ali Salah Edin Muhyiy organised the transport of the goods alongside 22,000 kg of sorbitol with batch numbers F2D171601 and F2D253601 (which were not documented by CAR) and; 3) Sinerji Gıda Kimya Tekstil confirmed that it has never sold any sorbitol product to Iraq.

38 On 22 February 2018, Tereos Starch and Sweeteners responded promptly to a formal trace request issued by CAR on 1 February 2018. Tereos Starch and Sweeteners confirmed that: 1) it shipped 6 tonnes of Sorbitol with

batch number F2C330602 (with 15 tonnes of Sorbitol with batch number F2C314602) to Sinerji, Turkey, on 5 March 2015 on board the SCT Santiago, from Antwerp, Belgium, under an invoice dated 25 February 2015 and a sea waybill dated 5 March 2015. Tereos Starch and Sweeteners confirmed that it exported all products in full compliance with international trade regulations. Tereos Starch and Sweeteners included copies of the relevant invoices, waybills, packing lists, health certificates and certificates of conformity in its response to CAR.

On 22 February 2018, Tereos Starch and Sweeteners responded promptly to a formal trace request issued by CAR on 1 February 2018. Tereos Starch and Sweeteners confirmed that: 1) it shipped 6 tons of sorbitol with batch number F2C314602 (with 15 tons of sorbitol with batch number F2C330602) to Sinerji, Turkey, on 5 March 2015 on board the SCT Santiago, from Antwerp, Belgium, under an invoice dated 25 February 2015 and a sea waybill dated 5 March 2015. Tereos Starch and Sweeteners confirmed that it exported all products in full compliance with international trade regulations. Tereos Starch and Sweeteners included copies of the relevant invoices, waybills, packing lists, health certificates and certificates of conformity in its response to CAR.

On 15 August 2017, Sinerji Gıda Kimya Tekstil responded to a formal trace request issued by CAR on 21 December 2016. This response confirms that Sinerji Gıda Kimya Tekstil exported the sorbitol with batch numbers F2D103611, F2D103601 and F2D113601, subject to CAR's trace request, to the Ale Cemal Elsavi company, Aleppo, Syria, in the following quantities:

a) Batch F2D103611 - 18,025 kg b) Batch F2D103601 - 3,000 kg c) Batch F2D113601 - 7,975 kg

Sinerji Gıda Kimya Tekstil transported the goods by lorry alongside 9,000 kg of sorbitol with batch numbers F2D065601, F2D067601, F2D075601, F2D072601 and F2D039602, (which were not documented by CAR) to the Öncüpınar border, south of Kilis, Turkey, and north of Azez, Syria, under an export declaration dated 1 September 2015. From the border, the recipient, Ale Cemal Elsavi, organised collection and transfer of the goods to its facility in Aleppo, Syria. Sinerji Gıda Kimya Tekstil cannot confirm if the goods were sold to a third party after it delivered the items to the Öncüpınar border. The company confirmed that it had never sold any sorbitol product to Iraq.

On 15 August 2017, Sinerji Gıda Kimya Tekstil responded to a formal trace request issued by CAR on 12 July 2017. This response confirms that: 1) Sinerji Gıda Kimya Tekstil exported 18,000 kg of sorbitol with batch number F20193601, subject to CAR's trace request, to the Ali Salah Edin Muhyiy company (a sister company to Ale Cemal Elsavi), Aleppo, Syria, under an export declaration dated 22 December 2015; 2) Ali Salah Edin Muhyiy organised the transport of the goods alongside 22,000 kg of sorbitol with batch numbers F2D171601 and F2D253601 (which were not documented by CAR); 3) Sinerji Gıda Kimya Tekstil confirmed that it has never sold any sorbitol product to Iraq.

39 While these quadcopters were by far the most prevalent type of UAV in CAR's field documentation sample, an IS propaganda video released on 24 January 2017 also depicted purported IS combatants fielding a Skywalker X8 fixed-wing UAV. Purchase lists of UAV components recovered from an IS UAV facility in the Muhandeseen neighbourhood of Mosul in early 2017 also listed 'X-8 white' aircraft. See Rassler, al-'Ubaydi, and Mironova (2017).

40 CAR documented these quadcopter UAVs at a storage facility in Baghdad, Iraq, on 8 April 2017 and 18 September 2019. Iraqi armed forces also captured four user-assembled, fixed-wing UAVs, likewise documented at the Baghdad storage facility. CAR has not yet been able to identify their manufacturers.

41 The unit costs of the quadcopter UAVs sold to Raiya Group and CMMV International Trading FZE, for example, were between USD 1,000 and USD 1,500. Invoices dated 16 November 2015 and 11 August 2016, on file with CAR.

42 On 18 February 2020, Vatech responded to a formal trace request issued by CAR on 3 August 2017. This response confirmed that: 1) on 16 November 2015, Vatech sold the DJI Phantom Pro drone with the component serial number P78DC125061070 and packaging serial number C1261717258817, the object of CAR's trace request, to Raiya Group (Baghdad, Iraq) for USD 1,350; 2) Vatech sold three additional DJI Phantom Pro drones to Raiya Group in the same transaction, which was paid in cash; and 3) Raiya Group bought nine Phantom-series quadcopters and eight other rotary-wing UAVs on four other occasions (20 August 2015, 29 September 2015, 28 January 2016, and 1 March 2016). On 20 July 2020 and 3 September 2020, Raiya Group responded promptly to a formal trace request and advance notification issued by CAR on 21 July 2020 and 2 September 2020, respectively. This response stated that: 1) Raiya Group did not purchase the DJI Phantom Pro drone with the component serial number P78DC125061070 and packaging serial number CI261717258817, the object of CAR's trace request; 2) Raiya Group has made no purchases of this type of materiel; and 3) Raiya Group additionally informed CAR that the company's sales centre has no visibility on any subsequent transfers/exports of materiel after sale to the original buyer.

43 On 8 July 2020, the owner of CMMV International Trading FZE and Dufri Gulf General Trading LLC spoke to a CAR investigator by telephone. They stated that: (1) Dufri Gulf General Trading LLC has now closed down, but previously operated a shop in Deira, Dubai, which sold the specific model UAVs to walk-in retail customers; (2) Neither CMMV International Trading FZE nor Dufri Gulf General Trading LLC sold these specific quadcopters to any other distributors, and made no other sales of these quadcopters except to individual retail customers via its shop in Deira; (3) that during 2016 there was no restriction on the off-the-shelf sale of these UAVs in Dubai, or record-keeping requirements, and hence they kept no records of who the UAVs were sold to, or the serial numbers of the UAVs sold. The owner further stated that he kept no records of who the quadcopters were sold to, and no records of the serial numbers of the Phantoms sold.

44 CAR telephone interview with Singapore distributor, 23 May 2019.

45 Customs code taken from an invoice dated 10 August 2016, on file with CAR.

46 Bill of lading dated 17 August 2016, on file with CAR.

47 CAR email correspondence with a jet engine specialist familiar with the amateur pulsejet community, 13 July 2020. For a popular, commercially available example, see HobbyKing (n.d.). There is no suggestion that IS forces procured this particular model.

48 CAR email correspondence with the US supplier, 2 May 2020; see also USDC Maryland (2017).

49 Photographs received from a confidential source, September 2017, on file with CAR.

50 Copy of plans purchased by 'David Soren', provided to CAR by the US supplier, 13 July 2020.

51 CAR email correspondence with a confidential source in Mosul, Iraq, 30 September 2017, and with a jet engine expert, 13 July 2020.

52 CAR interviews with a supplier, locations and exact dates withheld, 2020; contract obtained from a confidential source, on file with CAR. The UK front company was genuinely registered as a UK company but listed fictitious directors and shareholders in its registration documents. It was not registered in the UK's company register until July 2015, after several of the purchases mentioned in this section had already been undertaken. The UK company's name was (possibly intentionally) similar to a large number of other companies on the UK company register, making due diligence more difficult. The registered address was that of one of the IS weapon designer's genuine UK companies.

53 Contract dated May 2015, obtained from a confidential source, on file with CAR.

54 CAR interviews with two suppliers, locations and exact dates withheld, 2019 and 2020.

55 Email correspondence and metadata obtained from a confidential source, on file with CAR.

56 Online chat logs between the IS front company representatives and a supplier, obtained from a confidential source, on file with CAR.

57 Email correspondence and metadata obtained from a confidential source, on file with CAR. CAR has identified six UK companies and one Hong Kong company belonging to the IS weapon designer or their family and employees. Hong Kong Companies Registry (n.d.); Companies House (n.d.a).

58 Bank transfer documentation obtained from a confidential source, on file with CAR.

59 Bank transfer record obtained from a confidential source, on file with CAR; population records from the MERNIS National ID database, dated 2010, accessed via the C4ADS Seamless Horizons database; historical captures of website of Turkish company between March 2016 and March 2020, accessed via www.archive.org.

60 CAR telephone interview with individual involved in the sorbitol and fertiliser supply chains described in Section 2, precise date and location withheld, October 2020.

61 See the filing history for Advance Technology Global Limited, company number 09699478 (Companies House, n.d.b).

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