CENTER FOR DEFENSE REFORMS

REPORT

THE CHINESE FOUNDATION OF THE IRANIAN-RUSSIAN DRONE PROGRAM

SUMMARY

- Russia has significantly increased its use of Shahed (Russian name: Geran), Harpy and Gerbera UAVs, from 40 launches in September 2022 to 5,438 in June 2025. As of June 2025, 28,743 strike UAVs have been used against Ukraine.
- In previously published investigations, two Russian companies, Dolphin-Alabuga LLC and Albatros LLC, were named as the key manufacturers of the Shaheds. It was established that the former had never existed, and the latter was producing another type of UAV on the territory of the Alabuga SEZ. The real manufacturer of the Shaheds is Alabuga Machinery LLC, which is confirmed by official documents of the Russian Federation.
- In 2025, Alabuga Machinery LLC certified the production of motorboats Sh**** (this is how Shaheds are disguised in the Russian Federation). In particular, these are documents for production lines for the manufacture of both individual components and assemblies and finished products.
- In 2024-2025, Alabuga Machinery LLC imported from China a production line for the manufacture of hulls, as well as equipment for the manufacture of the Iranian Nasir navigation system, modules of which were found in the Shahed.
- In 2022-2023, Sollers Alabuga LLC supplied products to Alabuga Machinery LLC totalling about $370,000, probably parts for aircraft engines.
- In 2024, Drake LLC, a subsidiary of Alabuga Machinery, imported aircraft engine components worth $972,144 from China. The leading suppliers were the Chinese companies Jinhua Hairun Power Technology Company Limited and Shandong Xinyilu International Trade Co.
- In 2024-2025, the russian Morgan LLC imported goods from China for the production of drones, totalling $4,831,873 to the Alabuga SEZ. The largest suppliers were the Chinese Suzhou ECOD Precision Manufacturing Co. (also known as the manufacturer) and Suzhou Shunxinge Import and Export Trade Co., Ltd. In addition, Morgan LLC imported microcircuits manufactured by the Chinese Shandong Xinyilu International Trade Co., which were found in the Shahed UAV.
- In 2022-2025, Alabuga-Volokno LLC (part of Rosatom) imported about 3,000 tonnes of carbon fibre yarn from China, produced by the Chinese companies Jilin Tangu Carbon Fiber Co. and Jilin Chemical Fiber Friend Textile Co., for $21,387,850.
- China's Beijing Micropilot UAV Control System Ltd is considered by many investigators to be the manufacturer of the MD550 and MDR208 engines, as well as the BMP-1005 servos found in the Shaheds. At the same time, it has been established that it does not have its own production facilities and sells engines manufactured by another company from China, Limbach Aircraft Engine Co.

- Limbach Aircraft is the main supplier of engines, spare parts and technologies for Russian and Iranian UAVs. At the same time, Russia is gradually shifting from imports to localised production of UAV engines.
- Limbach Aircraft is owned by China's Fujian Delong Aviation Technology Co, which also owns Germany's Limbach Flugmotoren GmbH, one of the world's leading manufacturers of aircraft piston engines. Currently, Limbach Flugmotoren does not conduct mass production, but continues to develop new technologies.
- Limbach Aircraft is the recipient of numerous benefits from the Chinese government. In 2025, the company started designing a technology park that will significantly expand its production facilities.
- China's Redlepus TSK Vektor Industrial Co. and Russia's TSK Vektor LLC provided components for the Harpy UAV production, totalling $32.8 million.
- In 2022-2024, Shenzhen Juhang Aviation Technology Co. and TSK Vektor LLC imported UAV products worth $58.4 million to Russia. Almost 40% of all deliveries were engines, including L550e.
- The Chinese manufacturer of the engines found in the Gerbera UAV, Mile Hao Xiang Technology Co., shipped products worth more than $1.5 million to Russia in 2022-2023, either directly or through intermediaries. The main importers are the Russian companies Sequoia JSC and Unikom LLC.
- The Chinese government can significantly tighten control over the export of dual-use products, including aircraft engines. To do this, the following measures should be introduced: licensing of exporters, end-user control, product tracking, and increased penalties for violations.
- Many of the companies involved in this investigation are not subject to international sanctions at all or are only subject to sanctions imposed by certain countries. Detailed information is provided in the table at the end of the investigation.

1. INTRODUCTION

Since the beginning of Russia's full-scale aggression against Ukraine in February 2022, the issue of technological support for war has become critical. One of the key tools that significantly influenced the nature of the hostilities was Iranian unmanned aerial vehicles of the Shahed series (Russian name: "Geran"). Their use by Russia was the first example of the large-scale use of attack drones in a major war on the European continent.

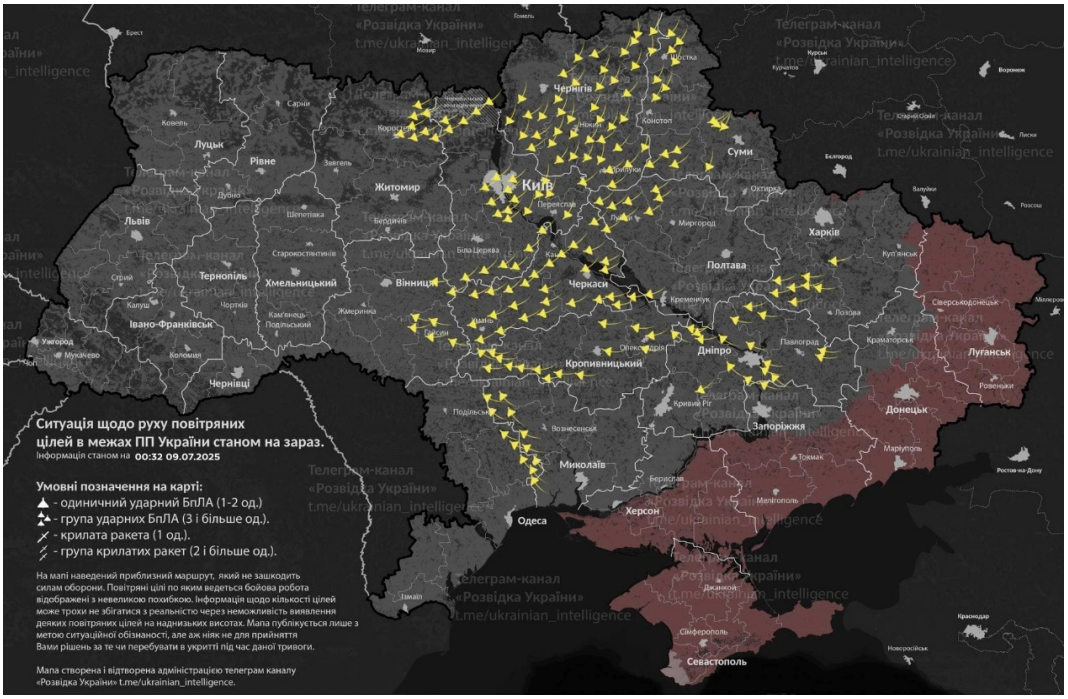
The most notable was the Shahed-136 (Geran-2), a flying munition created by Iran's HESA (Iran Aircraft Manufacturing Industrial Company) in close cooperation with the Islamic Revolutionary Guard Corps (IRGC) [1] . The main tactic of its use is massive swarm attacks, which complicates effective interception [2]. According to one version, the design prototype of the Shahed-136 was the Die Drohne Antiradar (DAR) drone, developed in the 1980s by German engineers [3]. The combination of simplicity of design, long range, high accuracy and low cost made the Shahed-136 one of the most effective tools in the war of attrition waged by the Russian Federation.

The use of these drones has allowed Russia to achieve several strategic objectives:

- depletion of the Ukrainian air defence system through massive attacks with cheap drones, forcing Ukraine to spend expensive missiles such as NASAMS, IRIS-T or Patriot [4];
- Attacks on critical infrastructure — in the autumn and winter of 2022-2023, Shahed became the main means of energy terror [5];
- psychological pressure — nighttime attacks, during which drones with a distinctive engine sound struck, in particular, civilian objects, created an atmosphere of constant stress among the civilian population [6].

Since September 2022, when Russia first used Iranian kamikaze drones, their attacks have become almost daily. The intensity has gradually increased, both in terms of the total number of launches and the scale of simultaneous attacks.

The first massive attack took place on 17 October 2022: 28 Shaheds attacked Kyiv. According to the mayor of the capital, Vitali Klitschko, five hits were recorded, including a critical infrastructure facility and a residential high-rise building [7]. The strike killed four people, including a couple who were expecting a child: the woman was six months pregnant [8].



Scheme of the movement of strike UAVs in the sky of Ukraine on 9 July 2025

In the following years, Russia rapidly increased the use of drones. While in September 2022, only about 40 launches were recorded, in June 2025, there were more than 5,300 [9][10]. On 25 November 2023, Russian troops set the first "record" by launching 75 Shaheds simultaneously [11]. Subsequently, this figure was repeatedly exceeded: in a number of attacks, more than 90 and sometimes more than 120 drones were recorded in one raid. The culmination was the night of 9 July 2025, when Russia launched more than 728 UAVs in one attack [12].

In total, according to President Volodymyr Zelenskyy, as of June 2025, Russia has used more than 28,743 Shahed drones against Ukraine since the start of the full-scale war [13].

2. DRONES FROM TEHRAN: THE START OF COOPERATION AGAINST UKRAINE

The first negotiations on the supply probably took place in late May 2022 in Tehran during the visit of Russian Deputy Prime Minister Alexander Novak. At that time, he handed over a list of industrial products that Russia needed to the Iranian side [14]. A month later, on the sidelines of the Caspian Summit, Vladimir Putin met with Iranian President Seyyed Ebrahim Raisi [15]. In July of the same year, Putin arrived in Tehran [16]. It was probably then that the parties reached key agreements on the supply of UAVs.

According to the US Administration, Iran sent the first batch of combat drones to Russia on 19 August 2022. There were at least two types of drones: "Mohajer-6", capable of covering about 200 km and carrying two missiles under each wing, and "Shahed" — kamikaze drones designed to destroy radar, artillery and other targets [17]. And in September, Ukrainian Air Force anti-aircraft gunners shot down one of the Mohajer-6 drones over the Black Sea [18].

According to Sky News, in November 2022, Russia paid Iran €140 million in cash and handed over Western weapons seized in Ukraine in exchange for the supply of UAVs. The transfer of Western weapons to the IRGC will allow them to copy Western technologies and use them in their own developments. As part of this agreement, Russia received more than 160 UAVs, including 100 Shahed-136 drones [19]. In the same month, according to The Guardian, Russia received six Mohajer-6s, as well as twelve Shahed-191s and Shahed-129s [20]. At the same time, the Main Intelligence Directorate of Ukraine reported plans to supply more than 200 Shahed-136, Mohajer-6 and Arash-2 drones to Russia [21].

Tehran and Moscow officially denied the delivery of the drones, but later Iran acknowledged the transfer of UAVs but insisted that it had happened before the full-scale invasion of Ukraine [22][23][24]. At the same time, in early September 2022, the Commander of the Islamic Revolutionary Guard Corps (IRGC), Major General Hussein Salami, noted that Iran was selling domestic military equipment to foreign buyers, including some major world powers, and training them to use this equipment [25].

2.1. TRANSFER AND LAUNCH OF "SHAHED-136" PRODUCTION

In July 2022, US National Security Advisor Jake Sullivan said that Iran was preparing to transfer hundreds of Shahed-136 attack drones to Russia [26]. In addition, it was reported that a Russian delegation visited an Iranian airfield at least twice during the month to inspect weapons-capable drones [27].

Already in September of the same year, the Ukrainian military announced the downing of an unidentified UAV near Kupiansk in the Kharkiv region. The remains of the drone were found to be an Iranian Shahed-136 kamikaze drone with a Geran-2 marking [28].

The first source to claim that the Geran-2 was a licensed copy of the Iranian Shahed-136 was the Russian portal Military Review, with a corresponding publication appearing in October 2022 [29]. It is noteworthy that it was published almost immediately after the Russian Permanent Repre-

sentative to the UN, Vasily Nebenzya, publicly called the reports of Iranian drones being supplied to Russia a fake [30].

At the official level, Iran's possible transfer of UAV production technologies became known in June 2023 from a joint report by several US agencies [31]. And in February 2024, the Iran Cyber News Agency reported that hackers from the PRANA Network leaked internal correspondence between the Sahara Thunder Company (a subsidiary of the Iranian Ministry of Defence) and structures from the Republic of Tatarstan (RF).

According to the US Department of the Treasury, in 2022, this company financed and supplied Russia with drones and other weapons and became a key intermediary in the transfer of technology, drawings, software and equipment for the mass production of Shahed-136 drones in Russia. The Sahara Thunder Company was also responsible for financial settlements and logistics, using networks in the United Arab Emirates and mechanisms to circumvent sanctions [32].

A leaked set of Sahara Thunder Company correspondence (hereinafter referred to as the Sahara Thunder documents) shows that Russia received Shahed production technology as early as 2022 [33].

Between 5 and 14 November 2022, a delegation from the Alabuga SEZ, which included specialists in airframes, avionics, engines and software, visited the Islamic Republic of Iran. The fact of the visit is confirmed by a source of the Russian independent media outlet Protocol, which is familiar with the internal processes of Alabuga [34]. The primary purpose of the visit was to acquire technology for the production of Dolphin 632 motorboats (this is how the Shahed-136 UAV is designated in documents). The plan also included the supply of Iranian components for drones [35].

According to the agreements, prior to the deployment of full-scale production in Russia, the Iranian side would provide most of the UAV components, except for a few elements, such as American microprocessors, Chinese spark plugs and French bearings. These components were considered to be available on the Russian market. The planned production capacity was 2,400 Shahed-136 units per year.

As part of the contract, Iran was also obliged to transfer to Russia

- complete design documentation for the Shahed-136, including the engine,
- production know-how, including descriptions of technological processes,
- the source code for the drone's software.

The ultimate goal of the project was to produce components for 6,000 Shahed-136s within 2.5 years and achieve 90% localisation of UAV production in Russia [36].

2.2. PRODUCTION IN ALABUGA

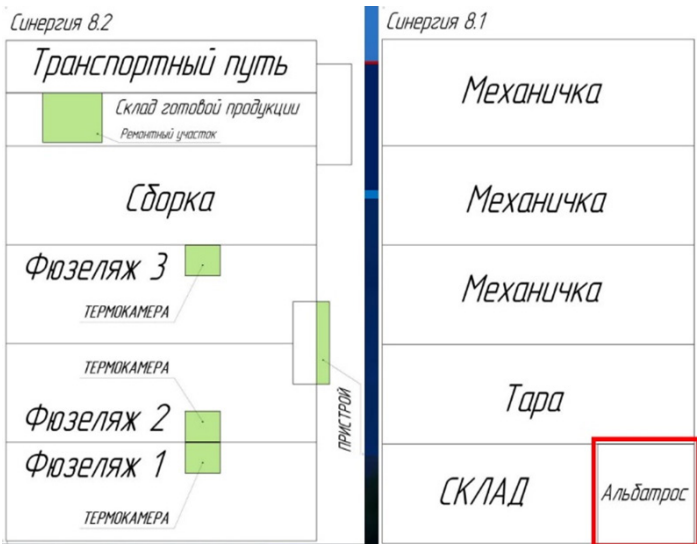
In early 2023, Russian media reported on preparations to launch new projects in the Alabuga Special Economic Zone, located about 10 km from the city of Elabuga in the Republic of Tatarstan. Two Russian companies were involved: Albatros LLC, which was supposed to manufacture drones, and Dolphin-Alabuga LLC, which announced plans to manufacture motorboats [37]. However, as Sahara Thunder's documents revealed, under the guise of boat production, Alabuga was preparing for the mass production of Iranian Shahed drones.

A comment on both projects was then made by a representative of Dolphin-Alabuga LLC, Alexei Florov, who stated that the start of production was scheduled for April 2023. It is likely that this comment was the basis for the fact that in previous publications both companies — Dolphin-Alabuga LLC and Albatros LLC — were mentioned as the main producers of Shahed.

However, further investigation revealed that at the time of the publication of such statements and subsequently, the company named Dolphin-Alabuga did not legally exist. The attempt by the Russian special services to create a cover for the covert production of drones was partially successful: in December 2023, this non-existent company was even included in the US sanctions list [38].

Florov himself turned out to be the general director of the Moscow-based Albatros LLC [39]. This company has been developing and manufacturing drones of the same name since 2017. Evidence of the use of these UAVs is freely available in the public domain. In particular, in September 2024, the Russian newspaper Izvestia reported on the use of Albatros drones in the war against Ukraine [40].

In 2023, Albatros LLC began additional production of UAVs in the Alabuga Special Economic Zone, in parallel with the Shahed project. According to the contract with Alabuga Development LLC, the company was to supply one hundred reconnaissance drones of its own production in 2023 [41]. One of Sahara Thunder's internal documents contains a diagram of buildings for the production of Shahed drones, where part of the space is provided for Albatros LLC. This suggests that Albatros LLC operated within the general production infrastructure but had its own task and separate production programme.



As for Florov's personal role in the Shahed project, it has not been definitively determined. In his company, he simultaneously serves as CEO, chief designer, and chief accountant [42][43]. Since September 2020, Florov has also been a director of Geomir JSC, a company specialising in software and hardware solutions in the space and agro-industry. Previously, in 2017, he worked as a junior researcher at the Institute of Design and Technological Informatics of the Russian Academy of Sciences and holds a PhD in engineering. He is a co-author of several economic, technological and research publications [44].

At the same time, in April 2023, Florov travelled to Tehran [45]. At the same time, according to Sahara Thunder documents, a delegation from the Alabuga Special Economic Zone travelled to Iran to expand cooperation in the field of drone production [46]. Considering Florov's technical qualifications, the above-mentioned comment and his visit to Iran, there is reason to believe that he could have participated in the launch of Shahed production in the role of a consultant — probably in terms of technical integration or adaptation of technologies.

SEZ PPT Alabuga JSC

The Joint Stock Company "Special Economic Zone "Alabuga" (JSC "SEZ PPT Alabuga" [47]) is a management company that administers the activities of residents on its territory, provides tax, customs and infrastructure benefits, and coordinates the implementation of investment projects [48].

It has been established that this structure plays a key role in organising the production of Shahed drones in the Russian Federation. Within the economic zone, conditions were created for the activities of several companies mentioned below, which are involved in the process of localisation, assembly and production of drones and related equipment.

The role of Alabuga is also evidenced by the fact that it was its CEO Timur Shagivaleyev who signed the documents on the transfer of gold to Sahara Thunder as a form of payment for the supply of components to produce drones [49].

Alabuga Machinery LLC

Alabuga Machinery LLC is an industrial enterprise registered in the Alabuga Economic Zone in October 2022 [50]. Its founders are Alabuga Development LLC (a subsidiary of Alabuga SEZ PPT JSC [51]) and GEA LLC [52].

In the first publications on the topic of Shahed production, the role of this company remained unclear. However, further investigation has revealed that Alabuga Machinery LLC plays a key production function in the Shahed production project in Russia.

Although the company is not mentioned directly as a manufacturer in Sahara Thunder's documents, several facts point to its direct involvement:

- the supplemental supply agreement concluded in July 2023 with Sahara Thunder was signed by Nikolai Aftapov, the chief executive of Alabuga Machinery LLC [53] [54];
- according to the production organisation scheme contained in the documents, UAV assembly is envisaged in buildings 8.1 and 8.2 of the Synergy Industrial and Technological Park in the Alabuga zone [55]; in December 2023, it was Alabuga Machinery LLC that announced a tender for the supply of technological equipment for building 8.1 [56].

Alabuga Machinery LLC was able to start the production process after the construction of the production buildings was completed in December 2022, according to media reports[57]. The project included not only the creation of production infrastructure but also staff training, so in March 2023, a group of specialists made their first trip to Iran. In parallel, the design documentation was being adapted to Russian requirements. At the same time, the process of assembling drones from Iranian machine kits continued [58].

According to Sahara Thunder's documents, the localisation of production was to take place in stages:

- manufacturing of its own airframes — from the fourth month of production,
- engines and avionics — from the twelfth month,
- launch systems and warheads — from the sixteenth month.

Thus, the company was expected to start fully localised production in late spring or early summer 2024.

According to the Protocol publication, in April 2023, Alabuga (probably meaning Alabuga Machinery) was supposed to assemble the first trial batch of 60 drones on its own. However, the planned production was disrupted and the process was several months behind schedule [59].

However, according to the Institute for Science and International Security (ISIS), the rate of assembly eventually exceeded the planned: 6,000 drones were produced by August 2024, almost a year ahead of schedule. The actual production capacity was about 4,700 units per year [60].

In 2024-2025, Alabuga Machinery systematically registered declarations of conformity for its production equipment. These documents are mandatory for the legal import and use of goods within the Eurasian Economic Union (including Russia). According to Russian law, such a declaration can be transferred to another company for use on the basis of a power of attorney. This creates an opportunity for Alabuga Machinery LLC to obtain foreign components through intermediaries or partnership structures.

The list of executed declarations includes several foreign technological equipment intended for industrial production [61]:

- heat treatment line model BQ-RJH-75 and low-pressure casting line model BQ-J452-2PWSG manufactured by Nanjing Boqiao Machinery Co., Ltd (18 October 2024);
- a set of equipment for the production of the Nasir high-precision navigation system (10 February 2025). This is an Iranian satellite navigation system that provides autonomous geospatial positioning with an accuracy of several metres [62]. Nasir modules were found in the Shahed-136 (Geran-2) drones shot down in Ukraine [63].

In addition, from February to June 2025, Alabuga Machinery LLC filed declarations for its own equipment for the production of motorboats — under this legend, Russia tried to hide the Shahed. This list provides a clear understanding of the company's business profile [64]:

- automatic inspection line for motorboat propulsion control systems Sh****;
- a set of calibrators for the motorboat steering system Sh****;
- automated line for machining of motorboat engine parts Sh****;
- automated optical inspection line of the motorboat autopilot motion control system Sh****;
- a set of equipment for the production of cast blanks for two-stroke internal combustion engine parts;

- automatic production line for the cable control system of a motorboat Sh****;
- testing station for electronic equipment of the motorboat system Sh****;
- a set of calibrators for motorboat systems Sh****;
- automatic system for modification of navigation materials by saturating the surface layer with carbon;
- testing station for electronic equipment of the motorboat control system Sh****;
- automated surface mounting line;
- automated line for machining of motorboat engine parts Sh****;
- a complex for production of tooling for motorboat parts Sh****.

The main structural components of the Shahed UAV are the airframe (fuselage), engine, avionics (electronics) and combat unit. For their localised production, Alabuga Machinery LLC needs the participation of suppliers, both domestic and foreign.

Sollers Alabuga LLC

Sollers Alabuga LLC is an automotive enterprise located in the Alabuga Special Economic Zone, which is part of the Sollers Group and specialises in the full cycle of light commercial vehicle production [65][66]. The company also operates an engine assembly site, which was acquired from Ford in 2021 [67].

According to the data available to the Centre for Defence Reforms (CDR), in December 2022, Sollers Alabuga LLC began supplying products to Alabuga Machinery LLC. In the first quarter of 2023, the volume of these deliveries amounted to about $370,000.

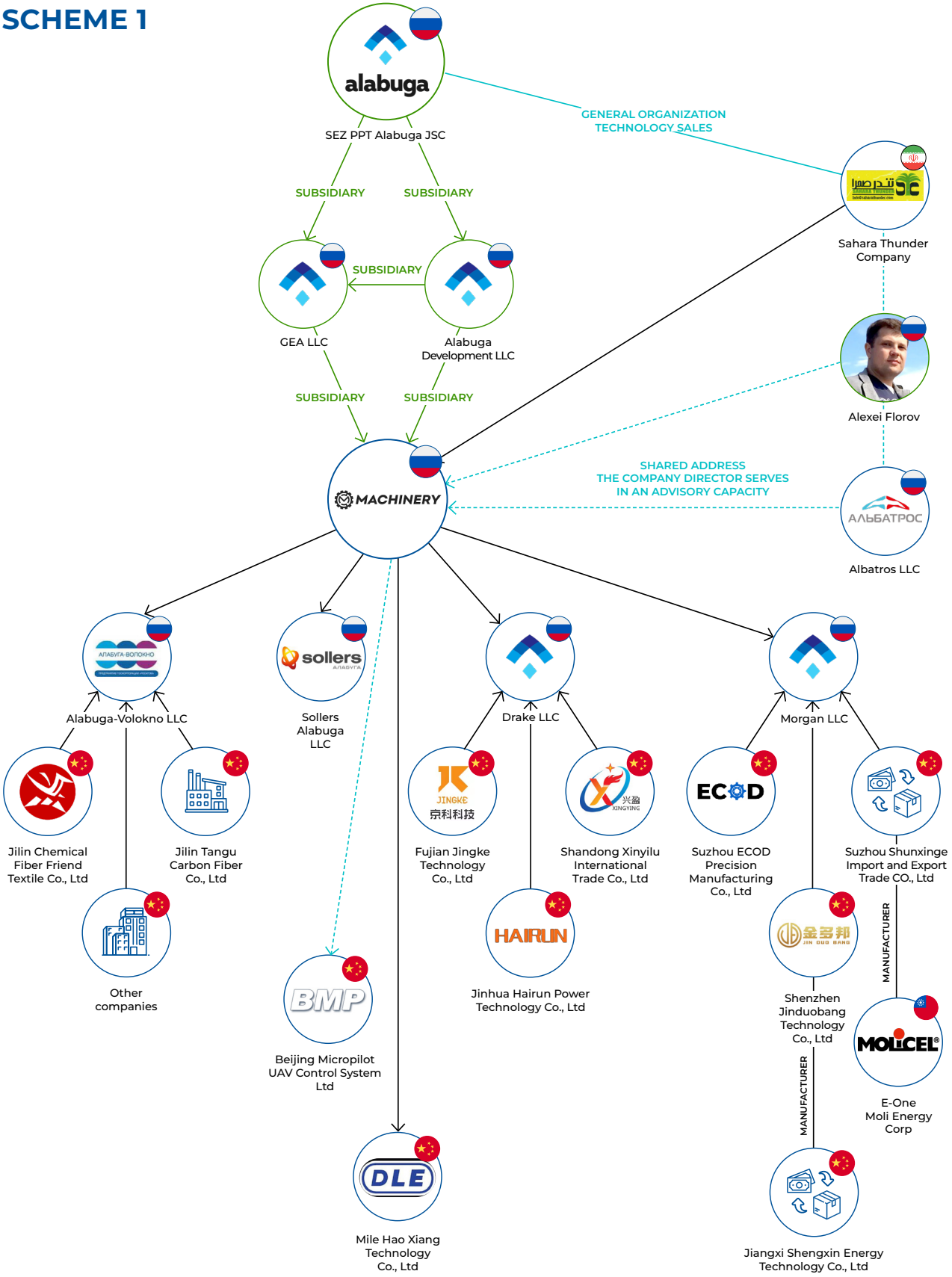
Given its existing production capabilities and technical base, the company is able to manufacture and supply engine components, including pistons, piston rings, crankshafts, as well as aluminium crankcases and other housing elements. It is likely that these components were supplied to Alabuga Machinery LLC.

Drake LLC

The company was founded in 2019 on the territory of the Alabuga Economic Zone as a manufacturer of agricultural machinery with a registered capital of only $150 [68]. Between September and December 2022, underwent a complete transformation: it received a new name — Drake, registered a different type of activity, and updated its ownership and management.

A group of young graduates of the Alabuga Polytech and Alabuga Start educational programmes become shareholders. Each of them received 10% of the company's shares — formally, the value of each share was only $15. Andrey Sapozhnikov was appointed CEO, who also headed GEA LLC, the second founding company of Alabuga Machinery LLC. After the imposition of sanctions, Sapozhnikov was formally dismissed in September 2024, but remained a "project manager" of Drake LLC, including signing import contracts. As of June 2025, he was not on the OFAC SDN list or the EU list.

SCHEME 1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Fiber Friend
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In January 2023, Drake LLC began importing consumer and industrial electronics. According to ISIS, in late 2022 and early 2023, the company purchased Dragonfish drones from the Chinese manufacturer Autel Robotics. These drones were supposed to be modified at the Alabuga base for further supply to the Russian military [69].

In June 2024, Drake LLC changed its owners and direction again. The company's shares are bought by Alabuga Development LLC and Alabuga Machinery LLC [70]. From that moment on, Drake LLC focuses on supplying components used in the production of Shaheds. At the same time, the company has been demonstrating an increase in its financial performance: in 2024, its profit increased by 260% compared to the previous year and amounted to about $1.85 million [71].

According to open customs databases, in June-November 2024, the company imported parts of piston internal combustion aircraft engines, fuel pumps, carburettors, rubber seals, hardware and other products from China with a total value of $972,144. The customs declarations do not specify the specific types of engines whose parts were imported, but the description of the compression rings states that they are installed on the pistons of a two-stroke engine with a capacity of 50 hp. These are the characteristics of the MD550 engines that are installed on the Shahed [72].

The main suppliers were the Chinese companies Jinhua Hairun Power Technology Company Limited (which is also the manufacturer) and Shandong Xinyilu International Trade Co.

In addition, in December 2024, Drake LLC imported 55 tonnes of carbon fibre fabric produced by Yixing Huaheng High-Performance Fiber Weaving Co., Ltd for a total of $3,423,223. The delivery was made by Shandong Xinyilu International Trade Co.

Morgan LLC

The company was registered on the territory of the Alabuga Special Economic Zone in March 2024 [73]. According to the register, the main type of its activity is "Other auxiliary activities related to transportation", which may indicate a logistics or transport and support specialisation. However, the actual nature of the activity remains uncertain. According to Ukrainian intelligence, the company is involved in the supply of components for UAVs [74].

According to the export-import database, in the period from August 2024 to January 2025, the company imported goods from China to the Alabuga Economic Zone for a total of $4,831,873. The nature of the products, as well as their labelling in customs declarations, indicate the company's possible involvement in the provision of components used in the production of UAVs.

Key import items:

- aluminium products — $1,275,105 (the largest share). The manufacturer and supplier is Suzhou ECOD Precision Manufacturing Co., Ltd. One of the cargoes, which arrived on 27 November 2024, was declared as products for defence purposes under the state defence order;
- lithium-polymer batteries — 7,800 units worth $980,270, listed in the documents as products for the needs of a "special military operation" (as the Russian Federation calls the war unleashed in Ukraine). Manufacturer: Jiangxi Shengxin Energy Technology Co., Ltd, supplier: Shenzhen Jinduobang Technology Co., Ltd. In addition, the supply of 140,000 batteries from Taiwan worth $890,000 manufactured by E-One Moli Energy Corp to the Chinese company Suzhou Shunxinge Import and Export Trade Co.;

- GNSS antennas for GPS/GLONASS navigation (can be installed in UAV control systems) worth $635,733;
- insulated electrical conductors worth $625,402, listed in the documents as products for the needs of a "special military operation";
- galvanic equipment and mechanical components: transmission parts, gears, couplings, gearboxes.

In September 2024, Morgan LLC also registered a declaration of conformity with the Eurasian Economic Union for the MIMXRT1052CVL5B and AD9361BBCZ chips manufactured by the Chinese company Shandong Xinyilu International Trade Co. At the same time, these chips are products of such companies as NXP Semiconductors and Analog Devices and were identified in the Shahed-136 and Shahed-238 drones [75][76]. There are no records of official imports of these chips in the export-import database, which may indicate that they were supplied outside of the usual customs channels — the so-called "grey" imports.

Alabuga-Volokno LLC

Alabuga-Volokno LLC is a carbon fibre manufacturing plant located in the Alabuga Special Economic Zone (SEZ) [77]. According to Sahara Thunder's documents, it is the main supplier of raw materials involved in the implementation of the Shahed project.

Between March 2022 and January 2025, Alabuga-Volokno LLC mainly imported synthetic yarns produced by the Chinese companies Jilin Tangu Carbon Fiber Co., Ltd and Jilin Chemical Fiber Friend Textile Co., Ltd.

During the period under review, about 3,000 tonnes of yarns were imported to Russia with a total value of $21,387,850. 12% of the products were supplied to the Russian Federation by direct deliveries from the manufacturer. The rest was supplied by such companies as Hebei Jigao Trading Co., Ltd, Jilin Hongsheng Trading Co., Ltd, Shijiazhuang Dingwei Trading Company Limited and Yongji Rongdu Commercial & Trading Co., Ltd.

Alabuga-Volokno LLC is a subsidiary of Yumatex JSC, a member of Rosatom State Corporation and the largest producer of carbon fibre in Russia [78].

3. UAVs RELATED TO "SHAHED"

Harpy

The Harpy-A1 is a Russian-made attack UAV that is a direct derivative of the Iranian Shahed-136. It is manufactured by the Izhevsk Electromechanical Plant Kupol (JSC IEMZ Kupol), which is part of the Russian state defence corporation Almaz-Antey [79].

The key design difference between the Harpy and the Shahed is the use of the Chinese L550e engine, which is manufactured by Xiamen Limbach Aircraft Engine Co [80].

The main suppliers of components for the Harpy UAV are:

- Xiamen Limbach Aircraft Engine Co. — supplies L550E engines through Chinese intermediaries (Redlepus TSK Vektor Industrial and Shenzhen Juhang Aviation Technology);
- Redlepus Vector Industry (Shenzhen) — provides avionics, electronic modules and mechanical components.

The existence of this model was first reported by Reuters in September 2024, citing intelligence sources. According to them, Russia has organised a large-scale production of long-range strike drones based on Iranian technology in China [81].

According to the analytical materials of the Central Research Institute of Arms and Military Equipment of the Armed Forces of Ukraine, which are at the disposal of the Centre for Defence Reforms, the Harpy looks almost identical to the Shahed. A similar conclusion was reached by experts from the Kyiv Scientific Research Institute of Forensic Expertise [82].

In May 2025, during a military parade in Moscow, the Geran and Harpy drones were publicly demonstrated for the first time [126]. Visually, the drones are almost identical — their differences are only noticeable upon detailed technical examination

According to European intelligence estimates, between July 2023 and July 2024, more than 2,500 Harpy-A1 UAVs were produced [83]. During the first half of 2024, production rates increased significantly, with more than 2,000 drones produced.

Due to its visual and structural similarities to the Shahed, it is difficult to identify the Harpy on the battlefield, so its use may have remained outside the scope of accurate documentation.

Gerbera

Based on the experience of the combat use of Iranian Shahed-136 kamikaze drones, Russia has begun developing a new type of drone — the Gerbera. This device has a simplified design: its airframe is made of foam and plywood, which makes it light, cheap and suitable for mass production. According to Ukrainian intelligence, the Gerbera is manufactured at the same production facilities in the Alabuga special economic zone where the Geran drones are assembled [84].

"The Gerbera is typically positioned as a reconnaissance or strike UAV, but its main purpose is to be used as a decoy. It serves as a cheap decoy drone that distracts enemy air defence systems. According to Forbes, the real value of the Gerbera lies in its ability to draw away air defence resources, making it difficult to intercept the main Shahed swarm [85].

According to Ukrainian intelligence, the Gerbera is manufactured in the Alabuga economic zone, at the same facilities as the Shahed

Structurally, the Gerbera is smaller than the Shahed-136, built as a flying wing with tailplane, and equipped with an internal combustion engine with a pusher propeller in the rear. The first reports of its downing in Ukraine date back to 24 July 2024 [86].

According to the Defence Intelligence of Ukraine, the fuselages for the Gerbera are manufactured by the Chinese company Skywalker Technology, which also supplies certain components to Russia through third-party suppliers. At the same time, the DLE60 engine, which is installed on this drone, is supplied by the Chinese company Mile Hao Xiang Technology Co., Ltd [87].

According to Defence Express, the public product catalogue of Skywalker Technology does not contain a model called "Gerbera", which indicates a possible special project commissioned by the Russian Federation [88].

4. CHINA'S ROLE IN SCALING UP PRODUCTION

After Iran handed over drawings, software, and production technologies for Shahed-136 drones to Russia, Russia created a large-scale logistics infrastructure for the drone programme. Initially, it was about importing ready-made devices and machine sets, but later, Russia established full-fledged domestic production.

Since then, Iran has faded into the background, with its involvement likely limited to consulting support and the supply of individual, minor or easily replaceable components. China has become the main external supplier, with critical components such as engines and navigation systems coming from China.

It has been established that Chinese companies were involved in the production of drones in Iran even before Russia's full-scale invasion of Ukraine. According to the documents available to the CDR, a number of Chinese components were found in drones shot down in Ukraine in 2022 (before their production in Russia) [89]:

- Shahed-131, downed in November 2022, had chipped ceramic filters for communication manufactured by Token Electronics Industry Co, as well as a cooling fan from Brushless Fan.
- current converters manufactured by VBsemi Electronics were identified in the Shahed-136 shot down in September 2022.

These findings indicate the existence of stable channels for the supply of Chinese technological components to Iranian UAV manufacturers even before the intensification of their use in the Russian-Ukrainian war.

After the launch of Shahed production in Russia, the share of Chinese components increased significantly: at least 41 components are of Chinese origin.

4.1 KEY CHINESE COMPANIES INVOLVED IN THE SUPPLY OF UAVS AND THEIR COMPONENTS

Beijing Micropilot UAV Control System Ltd

A Chinese company that positions itself as a manufacturer of power units and related equipment for UAVs, including flight control systems and wireless communication products.

According to Defence Express, MD550 engines manufactured by Beijing Micropilot were found in the Shahed-136 drones shot down over Ukraine [90]. This information is also confirmed by an ISIS report, which states that the engines of Iranian drones are of Chinese origin [91]. The current version of the company's website shows the products used in the production of UAVs [92]:

- MD550 — engine for the Shahed-136;
- MDR208 — engine for Shahed-131;
- BMP-1005 — servo drive.

The commercial offer of the MD550 aircraft engine, which is almost identical in appearance and technical characteristics to the German Limbach L550 engine, first appeared on the Beijing Micropilot website in 2013. Earlier, in 2011, this engine was offered on the website of the Iranian company Oje Parvaz Mado Nafar (Mado Company), which is currently down [93]. The fact that Beijing Micropilot was selling Iranian engines was also reported by IranWatch, a resource that monitors companies associated with Iran's missile and nuclear programmes, at [94].

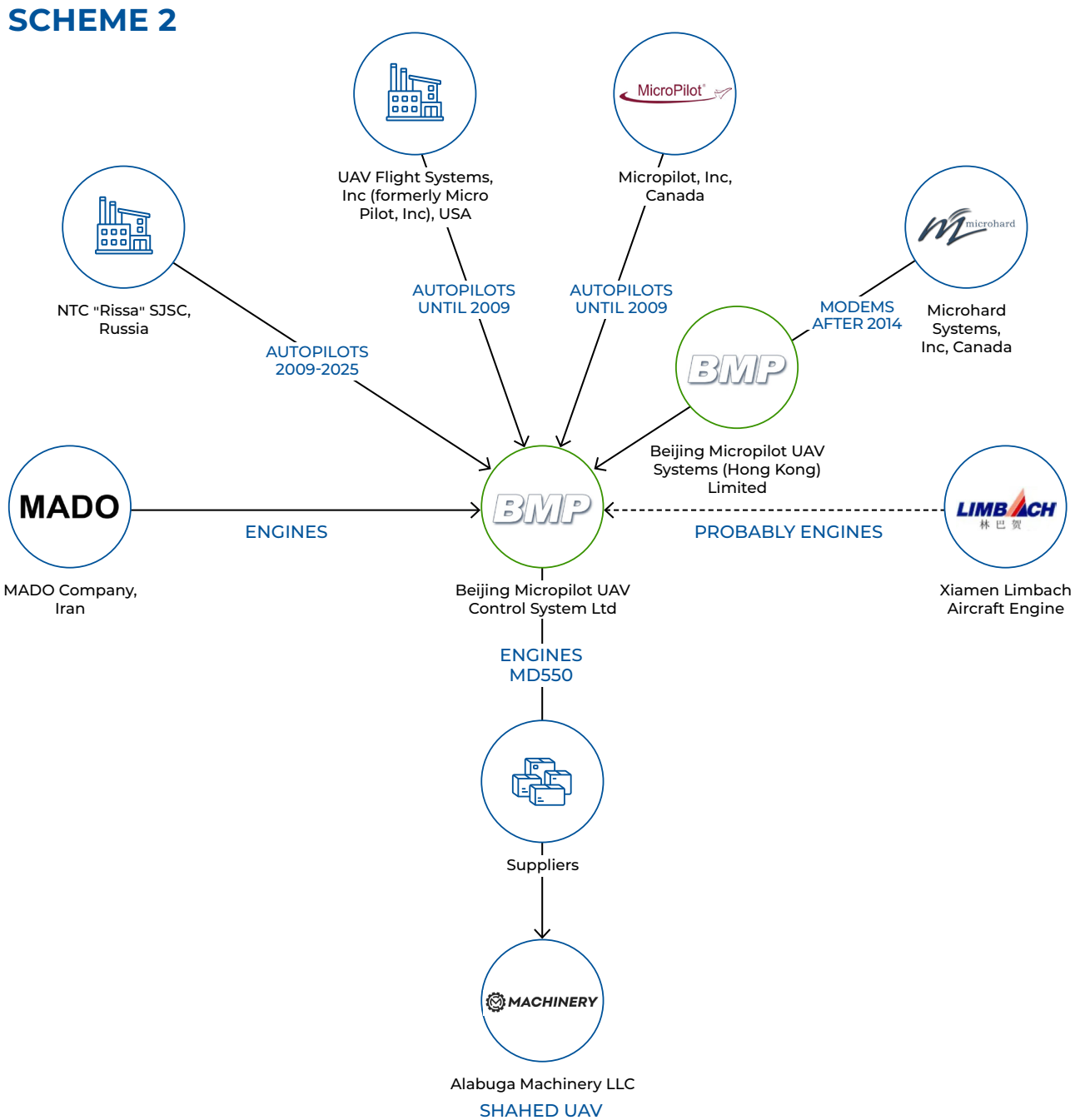
However, in 2015, according to the site's archives, the company began advertising engines under the Limbach 550 brand instead of MD550. This was probably due to the fact that in 2012, Xiamen Limbach Aviation Engine Co, a company specialising in the production of such engines, started operating in China. Subsequently, the sales offer on the Beijing Micropilot website changed several times: the engines were referred to as Limbach 550 and MD550.

The analysis of open sources revealed that Beijing Micropilot is a small engineering and trading company with minimal staff, which is engaged in research and development and also organises the assembly of UAV components, mainly through outsourcing. The company has no produc-

tion facilities of its own; the legal and actual addresses are office premises in Beijing. Although some profiles list it as a "manufacturer/factory, trading company", other resources explicitly state that the company cooperates with engine and equipment manufacturers to meet customer demand [95]. The simultaneous promotion of engines, modems and autopilots indicates an order-assemble-sell business model. This means that the engines imported to Russia under the Beijing Micropilot brand may have been produced at the facilities of the previously mentioned Xiamen Limbach Aviation Engine Co.

Since its inception, Beijing Micropilot has positioned itself as a dealer for American and Russian autopilot developers, including Micro Pilot, Inc and RISSA, and also sold products from Canada's Microhard Systems [96][97][98].

SCHEME 2



Screenshots from archived versions of the Beijing Micropilot website: changes in commercial listings for MD550 and Limbach 550 engines over the years

Xiamen Limbach Aircraft Engine

The company Limbach Aircraft Engine Co. (also known as Xiamen Limbach Aviation Engine Co.) was founded on 23 June 2012. Its main specialisation is the production of aircraft engines.

According to the press release of the US Office of Foreign Assets Control (OFAC), Limbach Aircraft supplied engines through Chinese intermediaries (Redlepus TSK Vektor Industrial and Shenzhen Juhang Aviation Technology) to the Russian enterprise JSC IEMZ Kupol, which produces Harpy drones [99]. The imports to Russia were carried out through the company TSK Vektor LLC [100]. The European Union also suspects that Xiamen Limbach may have passed on the L550 engine drawings to Iranian Shahed-136 manufacturers [101].

Limbach Aircraft is wholly owned by Fujian Delong Aviation Technology Co., Ltd, which also owns the German company Limbach Flugmotoren GmbH, one of the world's leading manufacturers of aircraft piston engines, which is engaged in both their development and maintenance [102].

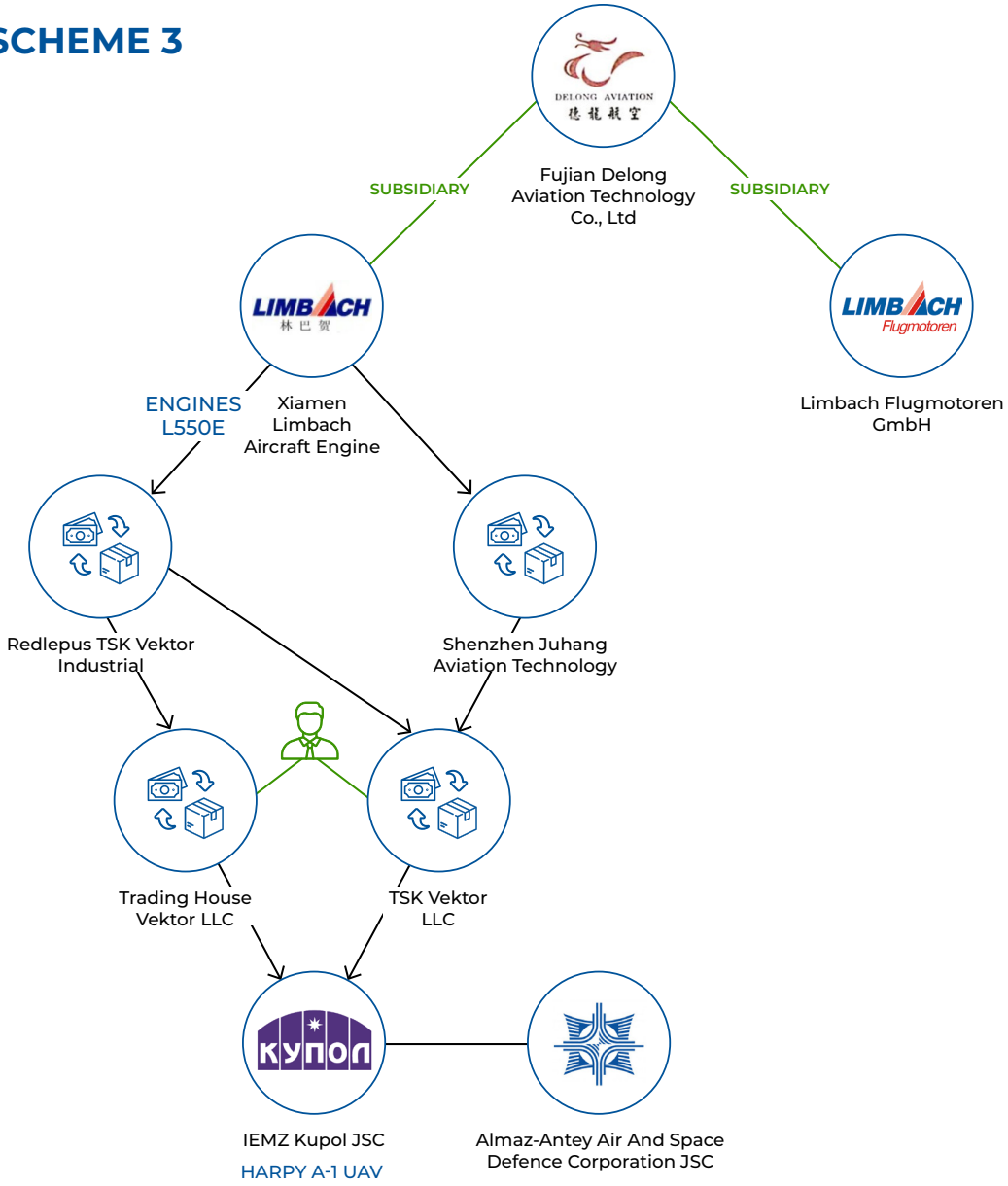
According to the information provided by the owners, Xiamen Limbach was established to localise the production of Limbach engines in China, while retaining the technology and technical heritage of the German company [103]. Some Chinese online resources describe Xiamen Limbach as a "German company based in China" [104].

In 2014, Limbach Aircraft patented the design of a small two-stroke four-cylinder aircraft engine. Although the patent itself does not specify a specific model, the drawings in the document are identical to those used in the descriptions of the L550e engine, which is currently available for sale on trading platforms [105].

The company has received 17 government subsidies, at least three of which in 2025, the amount of the subsidy is not disclosed [106]. Limbach Aircraft is included in the list of high-tech enterprises recognised and registered in 2024 . Companies on this list, in particular, pay reduced taxes [107][108].

In June 2025, the design of the Limbach Aviation Technology Park began in China. The building will have a total area of about 108,000 m² and will become the main production base for aircraft engines [109].

SCHEME 3



Redlepus TSK Vektor Industrial Co., Ltd

A Chinese company that has been used to supply components for Limbach engines and other components used in unmanned aerial vehicles to Russia [110].

According to the US Department of the Treasury, Redlepus cooperates with the Russian defence company TSK Vektor LLC, which acts as an intermediary between IEMZ Kupol JSC and Chinese suppliers in the implementation of the Harpy UAV project [111].

In the period from November 2023 to October 2024, TSK Vektor LLC and its affiliate, Trading House Vektor LLC, imported electronic and mechanical components from Redlepus, including aircraft engines, computer parts and electrical equipment, for a total of $32.8 million.

The name of Redlepus TSK Vektor Industrial includes the name "TSK Vektor", which indicates a close affiliation with the Russian partner and is likely to be used for marketing purposes to secure joint contracts.

Shenzhen Juhang Aviation Technology Co., Ltd

A Chinese company specialising in the supply of spare parts, materials and components for aviation. In 2022-2024, the company exported aviation products to the Russian Federation for a total of $58.4 million.

One of the company's key customers is TSK Vektor LLC, which is associated with the supply of equipment for the Izhevsk Electromechanical Plant Kupol, a manufacturer of Harpy drones. During this period, TSK Vektor imported products worth $51,111,619, including aircraft engines, engine components and electrical products: control systems, electric motors, telecommunications equipment and video equipment.

Engines accounted for almost 40% of all Juhang Aviation Technology's deliveries to TSK Vektor. In 2023-2024, the company supplied engines (in particular of the L550e model) and components for about $22 million.

It is also known that Shenzhen Juhang Aviation Technology Co. is currently actively looking for a Russian-speaking sales representative, which may indicate its intention to expand its presence in the Russian market [112].

Jinhua Hairun Power Technology Company Limited

Jinhua Hairun Power Technology Co., Ltd. was incorporated in February 2014 in Jinhua, Zhejiang Province, China. Between June and August 2024, it exported 685,609 engine parts (cylinders and piston kits) to Drake LLC.

Shandong Xinyilu International Trade Co., Ltd

A Chinese trading company registered in the province of Shandong. Trade activity with Russia began in April 2024. The only Russian buyers are Drake LLC and Morgan LLC from the Alabuga Economic Zone.

Between April 2024 and January 2025, the company exported industrial products worth a total of $6,408,119, including carbon fibre, engine parts, batteries and electronic components. According to the customs database, some of the exported goods, such as lithium-polymer batteries, are labelled as products for the needs of a "special military operation".

One of the codes under which the company exported is 852910 (GNSS antenna from Harxon Corporation), which is included in the Common High Priority Items List.

Fujian Jingke Technology Co., Ltd

The company specialises in the development, production and sale of motorcycle carburettors, as well as accessories for automotive and motorcycle equipment.

According to the customs database, in August 2024, Shandong Xinyilu International Trade Co., Ltd, shipped carburettors manufactured by Fujian Jingke Technology to the Russian company Drake LLC, worth $85,452. The total weight of the shipment was 1050 kg. Based on the approximate weight of one carburettor of 200-300 g, this volume is enough to equip about a thousand engines for UAVs.

Mile Hao Xiang Technology Co., Ltd

The company specialises in the development, production and marketing of aircraft engines for unmanned aerial vehicles. The main brand is DLE, under which two-stroke petrol engines with a displacement of 20 to 222 cm³ are produced [113]. The company has a "high-tech" status and enjoys local tax incentives and grants.

Mile Hao Xiang Technology engines have been detected in Gerbera-type UAVs [114]. According to the customs database, between December 2022 and November 2023, aircraft engines from this manufacturer were imported to Russia for more than $1.5 million, including $151,256 worth of engines directly from the company.

The largest supplier of DLE engines from Mile Hao Xiang Technology is Yiwu City Duniang Trading, which shipped products to Russia worth over $960,000.

The main importer of Mile Hao Xiang Technology engines is Sequoia JSC [115]. According to the information available to the CDR, in 2023, the commercial client of this company was NPO IZhBS LLC, a UAV manufacturer based in Izhevsk. The total volume of supplies reached $347,688.

Suzhou Ecod Precision Manufacturing Co. Ltd

Suzhou Ecod is a company specialising in high-precision manufacturing of metal and plastic parts according to individual customer drawings. The company offers a variety of online services for CNC machining, EDM, laser cutting, flat grinding, and more. Ecod is certified according to ISO 9001 and ISO 13485 standards [116].

ECOD started supplying to Russia in August 2024. Since then, the company has shipped $1,397,602 worth of products to Russia, mainly aluminium products supplied under the state defence order. The main importer (99.8%) is Morgan LLC, which supplies components for UAVs.

On 4 July 2025, the Security Service of Ukraine reported the discovery of parts with ECOD markings in the downed UAV, including a mount for launching a drone from a catapult [117].

The company has a Russified website cncmachiningmfg.ru with offers for the production of precision parts [118]. ECOD is probably trying to act as a full-fledged production operator in Russia, focused on the local market.

In April 2025, ECOD took part in the St. Petersburg Technical Fair, where it presented its metalworking capabilities [119].

Shenzhen Jinduobang Technology Co., Ltd

According to the company's official website, Shenzhen Jinduobang Technology specialises in the production and sale of high-tech electronic components and equipment [120]. In particular, it supplies chips, sensors, interface devices and other electronic components from well-known manufacturers such as Microchip, Realtek, STMicroelectronics, Xilinx and others.

According to the customs database, in January 2025, the company delivered two batches of lithium-polymer batteries totalling 7,800 units worth $91,171. In the customs data, these deliveries are labelled as "for the needs of a special military operation". The buyer of these batteries was Morgan LLC.

Despite the fact that Shenzhen Jinduobang Technology positions itself as a chip manufacturer, the company's certificates page contains documents (ISO 9001, patents, product testing reports and certificates of conformity of materials) that indicate the production of bushings, bearings and metal components. This is confirmed by technical test reports and patents. This may mean that Shenzhen Jinduobang Technology is probably a fabless company or produces limited batches of some microelectronic components.

The website has a Russian-language version, which indicates an active focus on the Russian market. In the section on exhibitions, there is a photo of a stand with inscriptions in Russian and advertising of products for UAVs [121]. The image was uploaded in September 2024, the same period when the company was listed as an exhibitor at RADEL, a specialised event in Russia that brings together electronics suppliers and manufacturers [122].

Shenzhen Jinduobang Technology's booth at the 2024 exhibition in Russia featuring advertisements for UAV components

Suzhou Shunxinge Import and Export Trade CO., Ltd

A Chinese company specialising in intermediary trade services — it imports and exports various goods (machinery, equipment, consumer goods).

According to the customs database, in December 2024, the company shipped to Morgan LLC lithium-ion batteries manufactured by Taiwanese manufacturer E-One Moli Energy (Molicel) in the amount of 140 thousand units, with a total value of $889 thousand.

These batteries were found in the wreckage of the Shahed UAV [123].

4.2. CHINA'S EXPORT CONTROLS

Since October 2020, China has had in force the Export Control Law , which introduced a unified system for regulating the export of sensitive goods and technologies [124]. It covers dual-use products, military equipment and other goods.

As part of the implementation of this legislation, on 31 July 2024, the Ministry of Commerce of the People's Republic of China, the General Administration of Customs and the Department of Armaments Development of the Central Military Commission jointly issued Notice No. 31 (2024) on the Adjustment and Improvement of Export Control Measures for Unmanned Aerial Vehicles. The document entered into force on 1 September 2024 [125].

In particular, aircraft engines with a maximum continuous power of more than 16 kW specifically designed for use in certain types of UAVs or unmanned aerial vehicles were banned from export. For comparison, the MD550 (Limbach L550) engines used in the Shahed UAV have a power output of 37 kW.

The introduced list of prohibited goods mentions HS codes 8407101010 and 8407102010 (internal combustion engines with spark ignition, with rotary or reciprocating piston movement). However, these codes do not cover all possible categories by which UAV engines can be classified. For example, TSK Vektor LLC imported Limbach L550 engines (supplied by Juhang Aviation Technology Company Limited) for the production of the Harpy drone under HS code 8407100003, which is not formally included in the prohibited list.

This example shows that despite the tightening of export controls by the Chinese authorities, there are gaps in the list of prohibited classification codes (HS codes) that allow for circumvention of restrictions. This indicates that export control measures are incompletely harmonised with the real risks of dual use, which, in turn, allows third parties — in particular, Russian manufacturers — to continue to obtain critical technologies despite formal bans.

5. SANCTIONS

The table below summarises the sanctions restrictions imposed on the institutions and companies mentioned in this report. As can be seen, the sanctions imposed are fragmented and do not provide an adequate deterrent effect for Russian companies and Chinese suppliers involved in the production of drones . Different levels of restrictions allow companies to adapt, continuing to develop weapons and critical products, as well as supplying products to UAV manufacturers.

Company	Line of business	Sanctions
JSC "SEZ PPT "Alabuga" (TIN 1646019914) Russia	The parent company of the Alabuga Economic Zone	USA, Switzerland, EU, Belgium, Australia, UK, France, Japan, Monaco, Ukraine
Alabuga Machinery LLC (TIN 1674003000) Russia	Production of Shahed/Geran	USA, Switzerland, EU, France, Monaco, Ukraine
Sollers Alabuga LLC (TIN 1674002165) Russia	Production of engines	Ukraine
Drake LLC (TIN 1646047020) Russia	Supply of engine components	USA, EU, France, Switzerland, Australia, Monaco, Ukraine
Morgan LLC (TIN 1674009033) Russia	Carriage of goods	Ukraine
Alabuga-Volokno LLC (TIN 1646031132) Russia	Production of hydrocarbon fibre	USA, EU, Japan, New Zealand, Switzerland, Ukraine
Izhevsk Electromechanical Plant "Kupol" (TIN 1831083343) Russia	Production of radar and radio navigation equipment, air defence systems, UAVs "Harpy"	USA, EU, France, Japan, Canada, Australia, Switzerland, New Zealand, Belgium, Monaco, Ukraine
TSK "Vektor" (TIN 3849055365) Russia	Supply of aircraft engines and components	USA, EU, UK, New Zealand, Switzerland, France, Monaco, Ukraine
Trading house "Vektor" (TIN 3808184570) Russia	Supply of components for UAVs	USA
Sequoia JSC (TIN 9703014733) Russia	Supply of aircraft engines	Sanctions are not applied
Unikom LLC (TIN 7814813801) Russia	Supply of aircraft engines	Sanctions are not applied
Fujian Jingke Technology (USCC 91350000154590699L) China	Production of spare parts and accessories for cars	Sanctions are not applied
Jinhua Hairun Power Technology Company Limited (USCC 913307230927997015) China	Supply of aircraft engine parts	USA, UK, Canada
Shandong Xinyilu International Trade Co.,Ltd (USCC 91370112MA3RNKQ371) China	Supply of aircraft engine parts	Ukraine
Yixing Huaheng High-Performance Fiber Weaving Co., Ltd (USCC 91320282728996445T) China	Production of carbon fibre	No sanctions are applied
Beijing MicroPilot UAV Control System Ltd (USCC 91110114737665904F) China	Supply of aircraft engines for UAVs	United Kingdom

Company	Line of business	Sanctions
Xiamen Limbach Aircraft Engine (USCC 91350200051193084R) China	Production and supply of aircraft engines and spare parts	USA, EU, France, Switzerland, Monaco, Ukraine
Mile Hao Xiang Technology Co., Ltd (USCC 91532526670858444Q)	Manufacture and supply of aircraft engines	USA, EU, France, Monaco, Switzerland, Ukraine
Fujian Delong Aviation Technology Co., Ltd (USCC 913502005949592772) China	Manufacture and supply of carburettors for piston engines	Sanctions are not applied
Shenzhen Juhang Aviation Technology Co., Ltd (USCC 91440300MA5GN73B4F) China.	Supply of aircraft engines and components	USA, UK, EU, Switzerland, France, Monaco, Ukraine
Yiwu City Duniang Trading Co. (USCC unknown) China	Supply of aircraft engines	Sanctions are not applied
Redlepus TSK Vektor Industrial (Shenzhen) Co (USCC 91440300MA5HX80Y1Q) China	Supply of components for UAVs	USA, France, UK, EU, Switzerland, Monaco, Ukraine
Suzhou Ecod Precision Manufacturing Co. Ltd. (USCC 91320506MA27AR11XL) China.	Supply of aluminium components for UAVs	Ukraine
Shenzhen Jinduobang Technology Co., Ltd (USCC 91440300MA5G151Q90) China	Supply of rechargeable batteries	Ukraine
Andrey Andreyevich Sapozhnikov (TIN 223403439644)	Until September 2024 General Director Drake LLC	No sanctions are applied
Lavrik Oleksandr Pavlovych (TIN 667902377683)	General Director of Drake LLC	Sanctions are not applied
Aftapov Nikolay Nakipovich (TIN 740417047609)	Till April 2025 General Director of Alabuga Machinery LLC	Ukraine
Marat Robertovich Khayretdinov (TIN 165048364581)	General Director of Alabuga Machinery LLC	No sanctions are applied
Aleksey Vadimovich Florov (TIN 501814379947)	General Director of Albatros LLC	USA
Timur Nailovich Shagivaliev (TIN 165503987841)	General Director of JSC "SEZ PPT "Alabuga"	USA, Australia, Ukraine
Aleksei Vyacheslavovich Matasov (TIN 632114511978)	General Director of Sollers Alabuga LLC	Ukraine
Haberling Andrey Vladimirovich (TIN 643906554855)	General Director of Alabuga-Volokno LLC	Ukraine
Smolin Aleksandr Aleksandrovych (TIN 860327014989)	General Director of Morgan LLC	Ukraine
Ziyatdinov Fanil Gazisovich (TIN 183504080445)	General Director of JSC "IEMZ "Kupol"	Ukraine
Artyom Mikhailovich Yamshchikov (TIN 381000781179)	General Director of LLC TSK Vektor, LLC Trading House Vektor	USA, EU, Switzerland, France, Monaco, Ukraine

Company	Line of business	Sanctions
Zakirova Dilyara Rinatovna (TIN 165003477458)	General Director GEA LLC	Sanctions are not applied
Aleksey Veniaminovich Semenov (TIN 213001923619)	General Director of Alabuga Development LLC	Sanctions are not applied
何鑫 (He Xin)	Head of Shenzhen Juhang Aviation Technology Co., Ltd	Sanctions are not applied
陈聪明 (Chen Conming)	Director of Fujian Delong Aviation Technology Co., Ltd and Xiamen Limbach Aircraft Engine	No sanctions are imposed
张学军 (Zhang Xuejun)	General Manager of Beijing Micropilot Uav Control System Ltd	Sanctions are not applied
尹锋 (Ying Feng)	Legal representative of Yixing Huaheng High-Performance Fiber Weaving Co., Ltd	Sanctions are not applied
周本金 (Zhou Benjing)	Legal representative of Jinhua Hairun Power Technology Company Limited	Sanctions are not applied
杨阿霞 (Yang Asya)	Legal representative of Fujian Jingke Technology Co., Ltd.	Sanctions are not imposed
董林 (Dong Ling)	Legal representative of Mile Hao Xiang Technology Co Ltd	Sanctions are not applied

6. CONCLUSION

Iran's transfer of Shahed attack drones to the Russian Federation has significantly influenced the course of hostilities in the full-scale war against Ukraine. These drones have become the embodiment of a new model of warfare — massive, inexpensive and asymmetric. In the absence of complete air superiority, Shahed allowed the Russian Federation to conduct systematic air attacks, terrorising Ukrainian cities and critical infrastructure.

A key stage in the evolution of this threat was the transfer of Shahed-136 production technologies by Iran, which became the basis for launching large-scale production of such drones in Russia. A full-fledged production cluster was created on the basis of the special economic zone "Alabuga", which was already operating ahead of the original plans in 2024. According to preliminary data, the Russian Federation has also launched the production of aircraft engines at the facilities of Drake LLC, which will reduce dependence on foreign suppliers.

Practical combat experience and production developments on the basis of Shahed became a platform for the creation of a drone of its own design — Harpy. This UAV, which looks identical to the Shahed, has a different filling, adapted to Russian (Chinese) electronics and navigation solutions. In particular, it uses the Chinese L550e engine manufactured by Xiamen Limbach Aircraft Engine Co. The Harpy-A1 is manufactured by the Izhevsk Electromechanical Plant Kupol, part of the Almaz-Antey state corporation.

China plays a decisive role in the implementation of this programme, which, despite its official neutrality, is a key supplier of critical components. For example, Redlepus Vector Industry (Shenzhen) provides Russia with engines, avionics and electronics. In addition, according to Ukrainian

intelligence, the Gerbera decoy drone is also a product of Chinese development — it was created by Skywalker Technology Co., Ltd. a company known as a manufacturer of amateur unmanned aerial vehicles. This UAV is used by Russia to deplete Ukraine's air defence system by diverting missiles to cheap, unarmed targets.

Thus, Russia's cooperation with Iran and China in the field of drone technology is not only a way to circumvent sanctions restrictions, but also a strategic factor that allows the Kremlin to maintain the intensity of air attacks. Simple to manufacture but massively deployed, these weapons have become an important part of Russia's military strategy. China, although not directly involved in the conflict, plays a critical role, providing the Russian military-industrial complex with key parts without which this model of warfare would be impossible.

To remedy the situation, it is necessary to ensure full coordination of sanctions policy between the allies — both in relation to Russian UAV manufacturers and Chinese companies involved in the supply of components. This involves the introduction of targeted multilateral sanctions, tighter control over the export of dual-use technologies from China, and increased diplomatic pressure from Western countries on Beijing to transfer critical technologies to Russia. It is also important to intensify the application of secondary sanctions against Chinese manufacturers and their owners who facilitate the supply of Western technology and know-how to Russia, which allows the production of weapons that are used not only against Ukraine but also potentially pose a threat to NATO countries.

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