



The role of Taiwan in supplying equipment to Russian companies involved in the production of the Pole-21 electronic warfare system

June 2026

Issue overview

Since the beginning of Russia's full-scale invasion of Ukraine in 2022, the Russian electronic warfare system Pole-21 has been systematically deployed to suppress satellite navigation signals across Ukrainian territory, disrupting the guidance systems of precision-guided munitions, UAVs, and other navigation-dependent weapons.

Pole-21 is a spatially distributed radio-electronic suppression system developed by the Scientific-Technical Center for Electronic Warfare (STC EW). At optimal deployment, a single complex with 100 antenna posts can cover an area of 150 × 150 km, creating a continuous jamming "dome" that denies satellite navigation to aircraft, cruise missiles, UAVs, and precision weapons.

Despite Russia's stated ambitions for domestic electronics independence, Pole-21's production remains critically dependent on Western-origin components that Russia cannot manufacture at home. These include microwave integrated circuits, FPGAs, high-frequency coaxial connectors, printed circuit boards, static converters, precision measurement instruments, and SMD assembly equipment.

In 2024, Russian companies received Taiwanese-manufactured equipment worth a total of approximately **USD 3.6 million**, including multilayer printed circuit boards, integrated circuits, electrical equipment for connections in electrical circuits, insulated coaxial cables, monolithic integrated circuits, computer data processing units, electrical capacitors, electrical resistors, semiconductor diodes, inductors, piezoelectric crystals, light-emitting diodes, transistors (silicon), transformers, devices for local area networks, electronic modules.

94% of the supplies came from Taiwanese companies: **Hannstar Board Corp, Innolux Corporation** and **Huang Liang Technologies Co., Ltd.**

Russian importers, **Trek LLC, TMI LLC, Fine Line LLC** have long-standing ties with the Russian military-industrial complex, in particular with Scientific-Technical Center for Electronic Warfare JSC, a manufacturer of electronic warfare systems Pole-21.

Given Russia's sustained and documented dependence on foreign technology for the production and maintenance of the Pole-21 electronic warfare system, and evidence that this supply

continued at least until the end of 2024, the Economic Security Council of Ukraine recommends that the government of Taiwan conduct a comprehensive review of its sanctions practices.

In particular, it is recommended that the International Trade Administration, Ministry of Economic Affairs of Taiwan:

- inform Taiwanese companies, including Hannstar Board Corp, Innolux Corporation and Huang Liang Technologies Co., Ltd of the potential use of their equipment for the needs of the Russian military-industrial complex;
- impose export restrictions on products and equipment that could be used for the purposes of the Russian Federation's military-industrial complex specified in this document;
- take measures to cease the supply of the products and equipment specified in this document to the Russian Federation via third jurisdictions, including Hong Kong and Turkiye.

Issue details

1. General information

Pole-21 (R-340RP) is a Russian electronic warfare system that has been in service with the Russian Army since 2016.¹ This system jams signals from navigation satellites, causing enemy missiles, aircraft and drones to either lose their signal or receive false coordinates, thereby reducing their effectiveness.² The system is particularly harmful to guided artillery shells and missiles that rely exclusively on satellite navigation. In systems that combine inertial and satellite navigation, Pole-21 reduces the accuracy of hits on the final target, as inertial navigation is less accurate without correction by satellite data.

Pole-21 has a modular architecture: the basic unit is the R-340RP radio station with antenna modules, which are mounted on towers, power line pylons or masts to form individual posts. Each post contains a container with equipment and up to three antennas, and is controlled by a console capable of managing up to a hundred positions.³ This creates a distributed radio jamming network across a large area, capable of covering up to 150 km². Furthermore, Pole-21 is capable of jamming signals from all known satellite systems, including GPS, GLONASS, Galileo and BeiDou.⁴

At the same time, the architecture of digital signal synthesis systems related to Pole-21 was based exclusively on foreign-made microchips: STM32 microcontrollers (ST Microelectronics), Xilinx FPGAs and Analog Devices DACs.⁵ The management of the Scientific-Technical Center for Electronic Warfare JSC openly acknowledged the shortage of Russian electronic components and viewed procurement on foreign markets as the only way to overcome it.⁶

2. Production of the Pole-21 electronic warfare system in Russia

The sole developer and manufacturer of the Pole-21 system is Scientific-Technical Center for Electronic Warfare (STC) — a company specialising in electronic warfare and radio-technical reconnaissance systems.⁷

¹ <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

² <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

³ <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

⁴ https://t.me/s/serhii_flash?before=598

<https://focus.ua/digital/557429-vs-rf-ustanavlivayut-moduli-reb-pole-21-na-domah-i-vyshkah-svyazi-zachem-eto-im-nuzhno>;

<https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

⁵ <https://cyberleninka.ru/article/n/razrabotka-programmnogo-obespecheniya-dlya-sistem-upravleniya-ustroystv-tsifrovogo-sinteza-signalov/viewer>;

⁶ https://vpk.name/news/139106_intellekt_na_sluzhbe_pvo.html;

⁷ ru. АО "НТЦ РЭБ" (Акционерное общество "Научно-технический центр радиоэлектронной борьбы"), TIN 7731529843; <https://checko.ru/company/ntc-rehb-1057748002850>;

The main areas of activity of Scientific-Technical Center for Electronic Warfare are:

- carrying out research and development work in the field of electronic warfare (EW) on behalf of the Russian Ministry of Defence and the Russian Ministry of Industry and Trade; the development and export of EW equipment;
- development and implementation of conceptual and policy documents relating to the creation and development of the Russian Federation's electronic warfare system; the identification and implementation of innovative projects for the development of electronic warfare equipment;
- development of proposals for the creation of integrated electronic warfare systems and their integration with other means of armed combat.⁸

Research conducted by the Economic Security Council of Ukraine revealed the Scientific-Technical Center for Electronic Warfare's network of first- and second-tier suppliers.

Foreign suppliers, mainly from the PRC and Türkiye, sell Western-manufactured components to second-tier importers; these then pass on to first-tier manufacturers or distributors, who assemble components for Scientific-Technical Center for Electronic Warfare – the manufacturer of the Pole-21 electronic warfare system.

As a result, the network operates through multi-tier resale, with a predominance of distribution links at lower levels and relatively small amounts in individual transactions, which makes it possible to maintain continuity of supply whilst spreading financial risks.

3. Supply of equipment manufactured by Taiwanese companies to the Russian Federation

In 2024, multilayer printed circuit boards, integrated circuits, electrical equipment for connections in electrical circuits, insulated coaxial cables, monolithic integrated circuits, computer data processing units, electrical capacitors, electrical resistors, semiconductor diodes, inductors, piezoelectric crystals, light-emitting diodes, transistors (silicon), transformers, devices for local area networks, electronic modules manufactured by the Taiwanese companies **Hannstar Board Corp**, **Innolux Corporation** and **Huang Liang Technologies Co., Ltd** worth a total of approximately **USD 3.6 million** were imported into the Russian Federation.

All deliveries were made by companies based in Hong Kong and Türkiye.

Among Russian importers, **Trek LLC**, **Norcap LLC**, **TMI LLC**, **Fine Line LLC**, **Components and Engineering LLC** – have long-standing ties with the Russian military-industrial complex, in

⁸ <https://xn----7sbbigfb2afofyenmkgq1cxevdua.xn--p1ai/files/Reestr/Company/Bezopasnost/NB%201-31.pdf>; <https://stm-group.su/about/client/ntts-reb/>;

particular with Scientific-Technical Center for Electronic Warfare, a manufacturer of electronic warfare systems.

Below are detailed examples of supplies of Taiwan-made products imported by companies linked to Scientific-Technical Center for Electronic Warfare.

Hannstar Board Corp

Hannstar Board Corp – is a Taiwanese technology company founded in 1989 and headquartered in Taoyuan, specialising in the manufacture of printed circuit boards (PCBs) for the electronics industry. Its products include multilayer, double-sided and high-tech boards used in servers, telecommunications equipment and industrial systems. It is part of a large group of electronic component manufacturers and has significant production capacity, including facilities in Taiwan and the PRC.⁹

In 2024, the Turkish company Ix Medikal Buro Malzemeleri Ticaret, which is subject to sanctions, supplied printed circuit boards manufactured by Hannstar Board Corp to the Russian Federation, with a total value of USD 3.1 million.¹⁰

The Russian importer was **Fine Line LLC**.¹¹ The company describes itself as the Russian representative office of the German-Israeli printed circuit board manufacturer Fineline. However, the global office claims to have severed ties with its Russian branch.

Between Q4 2024 and Q3 2025, Fine Line supplied goods to another Russian company, Enel LLC, for a total of USD 766 thousand.

Enel LLC is a Russian company specialising in the supply of electronic components, materials, equipment and devices manufactured both domestically and abroad. As part of a production partnership for the UMPB D-30SN (aircraft bomb), it supplies PEMZ Molot JSC with S2-33-0.5-3.3 Ω $\pm 5\%$ A-D-V resistors.¹²

Between Q3 2024 and the Q2 2025, Enel LLC supplied equipment worth USD 1.9 million to the Scientific-Technical Centre for Electronic Warfare.

Innolux Corporation

⁹ <https://tw.hannstarboard.com/en/>;

¹⁰ <https://www.opensanctions.org/entities/NK-ESMkeUn3dHe3fbbwGGunek/>;

¹¹ <https://fineline-pcb.ru/>; <https://checko.ru/company/fayn-layn-1147746048999#>;

¹² <https://war-sanctions.gur.gov.ua/en/components/companies/9281>;

Innolux Corporation is a major Taiwanese electronics company, founded in 2003 and headquartered in Miaoli, Taiwan. It is one of the world's leading display manufacturers and specialises in the production of TFT-LCD panels, touchscreen modules and displays. The company has significant manufacturing capacity in Taiwan (around 14 factories) and a global presence, supplying products worldwide. With its major TFT plants located in Zhunan and Tainan, both in Taiwan, Innolux has also established overseas module plants in the Chinese cities of Ningbo, Foshan, and Shanghai.¹³

In 2024, the Hong Kong-based company Hk Jie An Da Logistics Company Limited supplied colour monitors worth USD 286 thousand to the Russian company **TMI LLC**.

TMI LLC manufactures various types of electronic equipment, including printed circuit boards for servers and telecommunications equipment.¹⁴

In Q4 2024, TMI supplied equipment worth USD 104 thousand to another Russian company, **Mosttekharant LLC**.¹⁵ In turn, between Q3 2024 and Q2 2025, Mosttekharant supplied equipment worth USD 102 thousand to the Scientific-Technical Centre for Electronic Warfare.

Furthermore, under government procurement contracts, the company supplied telecommunications equipment to Voentelecom JSC, which provides communications services to the Russian Armed Forces.¹⁶

Huang Liang Technologies Co., Ltd

Huang Liang Technologies Co., Ltd. is a Taiwanese company specialising in the manufacture of radio frequency (RF) and microwave components. It has over 30 years' experience in the design and manufacture of coaxial connectors, adaptors and cable assemblies used in telecommunications, 5G/6G, aviation, the defence industry and measurement technology. The company combines in-house engineering, high-precision CNC manufacturing and flexible production capabilities, enabling it to create both standard and bespoke solutions for customers worldwide. The company's headquarters are located in Kaohsiung (Yanchao District), Taiwan, where its main production base is also located.¹⁷

In 2024, the Russian company **Trek JSC** received electrical equipment for connections in electrical circuits and insulated coaxial cables manufactured by Huang Liang Technologies Co., Ltd. worth USD 226 thousand. The suppliers were the Hong Kong-based companies Jiating Product Factory Limited, 5-star Trading Co., Limited and E-hopping Co., Limited.

¹³ https://hrrecruit.innolux.com/globalweb_s/en/index.html;

¹⁴ <https://checko.ru/company/tmi-1157746817546#>;

¹⁵ OOO "MOCTEXFAPAH" (TIN 7733354564); <https://checko.ru/company/mtg-1207700156290>;

¹⁶ <https://checko.ru/company/tmi-1157746817546#contracts>;

¹⁷ <https://www.hltechmw.com/>;

Trek JSC is engaged in wholesale trade, including electronic components. According to journalistic investigations in open sources, the company was established to circumvent sanctions and import Western microelectronics to Inkotech following the imposition of sanctions on AI Q COMPONENTS LLC, a major supplier of electronic components to Inkotech.¹⁸

Trek LLC is linked to **Inkotech LLC**, as Trek's official telephone number (7931321-82-24) is the personal number of one of Inkotech's owners, namely Olga Vyacheslavovna Shchenova.¹⁹ Open sources indicate that it was from 2022 onwards that the company's profits began to grow by over 100%, which may indicate an increase in imports of Western components in circumvention of sanctions.²⁰ This is confirmed by customs data: between March 2024 and March 2025, the company imported goods worth over USD 14 million.

It is important to note that Trek LLC is a Russian importer of Chinese SWIWIN SW800Pro jet engines, which are used in the S8000 Banderol cruise missiles, and Jetpower PTE-800A2 engines, which are installed on the S8001 Banderol variant. The company was involved in supplying foreign components to enterprises within the Russian defence industry, including KRONSTADT JSC.²¹

Given Trek's profile as a supplier of electronic components, an importer of microelectronics and equipment, as well as its confirmed links with enterprises of the Russian defence industry, it is logical to assume that the company's products may be used by the Scientific-Technical Centre for Electronic Warfare through supplies to Inkotech as part of the development, modernisation and technical support of the Pole-21 electronic warfare system.

¹⁸ <https://dron.media/proizvoditel-rossiiskikh-rakiet-prodolzhayet-zakupat/>; АО "ТРЭК" (TIN: 7731374420); <https://checko.ru/company/trehk-1177746650245>;

¹⁹ <https://www.occrp.org/ru/novosti/vaznye-istorii-import-komplektuiushhix-dlia-raket-kalibr-i-zrpk-pancir-prodolzaetsia-nesmotria-na-sankcii>; Щенова Ольга Вячеславовна (TIN: 780707530789)

²⁰ <https://checko.ru/company/trehk-1177746650245#finances>;

²¹ <https://war-sanctions.gur.gov.ua/ru/components/companies/12736>; АО "КРОНШТАДТ" (TIN 7808035536);

Recommendations

Given Russia's sustained and documented dependence on foreign technology for the production and maintenance of the Pole-21 electronic warfare system, and evidence that this supply continued at least until the end of 2024, the Economic Security Council of Ukraine recommends that the government of Taiwan conduct a comprehensive review of its sanctions practices.

In particular, it is recommended that the International Trade Administration, Ministry of Economic Affairs of Taiwan:

- inform Taiwanese companies, including Hannstar Board Corp, Innolux Corporation and Huang Liang Technologies Co., Ltd of the potential use of their equipment for the needs of the Russian military-industrial complex;
- impose export restrictions on products and equipment that could be used for the purposes of the Russian Federation's military-industrial complex specified in this document;
- take measures to cease the supply of the products and equipment specified in this document to the Russian Federation via third jurisdictions, including Hong Kong and Turkiye.

About us

The Economic Security Council of Ukraine (ESCU) — is an independent, impact-oriented Kyiv-based institution that identifies and mitigates internal and external threats to Ukraine's economic security. The ESCU was established to strengthen the capacity of the state and civil society to resist aggression, illicit influence, and abuse in strategically important areas.

Website: <https://reb.org.ua/en/>

E-mail: secretary@escu.ua

List of annexes

Annex 1. Major Taiwanese Manufacturers Supplying Goods to Russian Companies Linked to the Manufacturer of Pole-21

Taiwanese producing company	HS code	Total value of supplies to Russia, USD (2024)	Supplier (intermediary)	Importer	A client of an import company with links to the manufacturer of Pole-21	Russian Pole-21 manufacturer (potential end user)
Hannstar Board Corp	8534 00	3 177 333	Ix Medikal Buro Malzemeleri Ticaret Limited Sirketi (Turkiye)	Fine Line LLC	Enel LLC	Scientific-Technical Center for Electronic Warfare (STC)
Innolux Corporation	8528 59	286 800	Hk Jie An Da Logistics Company Limited (Hong Kong)	TMI LLC	Mosttekharant LLC	Scientific-Technical Center for Electronic Warfare (STC)
Huang Liang Technologies Co Ltd	8536 69 8535 90 8544 20	226 777,49	Jiating Product Factory Limited (Hong Kong) 5-star Trading Co., Limited (Hong Kong) E-hopping Co., Limited (Hong Kong)	Trek JSC	Inkotech LLC	Scientific-Technical Center for Electronic Warfare (STC)



The role of the Japanese company Panasonic in supplying equipment to Russian companies involved in the production of the Pole-21 electronic warfare system

June 2026

Issue overview

Since the beginning of Russia's full-scale invasion of Ukraine in 2022, the Russian electronic warfare system Pole-21 has been systematically deployed to suppress satellite navigation signals across Ukrainian territory, disrupting the guidance systems of precision-guided munitions, UAVs, and other navigation-dependent weapons.

Pole-21 is a spatially distributed radio-electronic suppression system developed by the Scientific-Technical Center for Electronic Warfare (STC EW). At optimal deployment, a single complex with 100 antenna posts can cover an area of 150 × 150 km, creating a continuous jamming "dome" that denies satellite navigation to aircraft, cruise missiles, UAVs, and precision weapons.

Despite Russia's stated ambitions for domestic electronics independence, Pole-21's production remains critically dependent on Western-origin components that Russia cannot manufacture at home. These include microwave integrated circuits, FPGAs, high-frequency coaxial connectors, printed circuit boards, static converters, precision measurement instruments, and SMD assembly equipment.

In 2024, the Chinese company **Qinyi Electronics Co., Ltd** supplied the Russian company **Smttech LLC** with process equipment for the manufacture of printed circuit boards (HS code 8479 89) worth USD 657 thousand produced by the Chinese company **Panasonic Factory Solutions Suzhou Co., Ltd**, a subsidiary of the **Panasonic Corporation**.

Given Russia's sustained and documented dependence on foreign technology for the production and maintenance of the Pole-21 electronic warfare system, and evidence that this supply continued at least until the end of 2024, the Economic Security Council of Ukraine recommends that the government of Japan conduct a comprehensive review of its sanctions practices.

In particular, it is recommended that the Ministry of Economy, Trade and Industry (METI):

- inform the Japanese company Panasonic Corporation regarding the supply of products manufactured by Panasonic Factory Solutions Suzhou Co., Ltd to the Russian Federation and the risks associated with the use of these products for the needs of the Russian military-industrial complex;

- take measures to cease the supply of the equipment specified in this document to the Russian Federation via third jurisdictions, including the PRC.

Issue details

4. General information

Pole-21 (R-340RP) is a Russian electronic warfare system that has been in service with the Russian Army since 2016.²² This system jams signals from navigation satellites, causing enemy missiles, aircraft and drones to either lose their signal or receive false coordinates, thereby reducing their effectiveness.²³ The system is particularly harmful to guided artillery shells and missiles that rely exclusively on satellite navigation. In systems that combine inertial and satellite navigation, Pole-21 reduces the accuracy of hits on the final target, as inertial navigation is less accurate without correction by satellite data.

Pole-21 has a modular architecture: the basic unit is the R-340RP radio station with antenna modules, which are mounted on towers, power line pylons or masts to form individual posts. Each post contains a container with equipment and up to three antennas, and is controlled by a console capable of managing up to a hundred positions.²⁴ This creates a distributed radio jamming network across a large area, capable of covering up to 150 km². Furthermore, Pole-21 is capable of jamming signals from all known satellite systems, including GPS, GLONASS, Galileo and BeiDou.²⁵

At the same time, the architecture of digital signal synthesis systems related to Pole-21 was based exclusively on foreign-made microchips: STM32 microcontrollers (ST Microelectronics), Xilinx FPGAs and Analog Devices DACs.²⁶ The management of the Scientific-Technical Center for Electronic Warfare JSC openly acknowledged the shortage of Russian electronic components and viewed procurement on foreign markets as the only way to overcome it.²⁷

5. Production of the Pole-21 electronic warfare system in Russia

The sole developer and manufacturer of the Pole-21 system is Scientific-Technical Center for Electronic Warfare (STC) — a company specialising in electronic warfare and radio-technical reconnaissance systems.²⁸

²² <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

²³ <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

²⁴ <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

²⁵ https://t.me/s/serhii_flash?before=598

<https://focus.ua/digital/557429-vs-rf-ustanavlivayut-moduli-reb-pole-21-na-domah-i-vyshkah-svyazi-zachem-eto-im-nuzhno>;

<https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

²⁶ <https://cyberleninka.ru/article/n/razrabotka-programmnogo-obespecheniya-dlya-sistem-upravleniya-ustroystv-tsifrovogo-sinteza-signalov/viewer>;

²⁷ https://vpk.name/news/139106_intellekt_na_sluzhbe_pvo.html;

²⁸ ru. АО "НТЦ РЭБ" (Акционерное общество "Научно-технический центр радиоэлектронной борьбы"), TIN 7731529843; <https://checko.ru/company/ntc-rehb-1057748002850>;

The main areas of activity of Scientific-Technical Center for Electronic Warfare are:

- carrying out research and development work in the field of electronic warfare (EW) on behalf of the Russian Ministry of Defence and the Russian Ministry of Industry and Trade; the development and export of EW equipment;
- development and implementation of conceptual and policy documents relating to the creation and development of the Russian Federation's electronic warfare system; the identification and implementation of innovative projects for the development of electronic warfare equipment;
- development of proposals for the creation of integrated electronic warfare systems and their integration with other means of armed combat.²⁹

Research conducted by the Economic Security Council of Ukraine revealed the Scientific-Technical Center for Electronic Warfare's network of first- and second-tier suppliers.

Foreign suppliers, mainly from the PRC and Türkiye, sell Western-manufactured components to second-tier importers; these then pass on to first-tier manufacturers or distributors, who assemble components for Scientific-Technical Center for Electronic Warfare – the manufacturer of the Pole-21 electronic warfare system.

As a result, the network operates through multi-tier resale, with a predominance of distribution links at lower levels and relatively small amounts in individual transactions, which makes it possible to maintain continuity of supply whilst spreading financial risks.

6. Supply of equipment manufactured by Japanese companies to the Russian Federation

In 2024, the Chinese company **Qinyi Electronics Co., Ltd** supplied the Russian company **Smttech LLC** with process equipment for the manufacture of printed circuit boards (HS code 8479 89) worth USD 657 thousand produced by the Chinese company **Panasonic Factory Solutions Suzhou Co., Ltd**, a subsidiary of the **Panasonic Corporation**.

Panasonic Factory Solutions Suzhou Co., Ltd is a manufacturing and engineering subsidiary of the Japanese corporation Panasonic, based in Suzhou (China). It forms part of the Panasonic division dedicated to 'smart' manufacturing solutions and specialises in the development and manufacture of equipment for the electronics industry, in particular SMT machines (equipment for mounting electronic components onto printed circuit boards), as well as related automated systems. The company combines research, manufacturing, sales and service, operating as Panasonic's key manufacturing base for this segment in the PRC.

²⁹ <https://xn----7sbbigfb2afofyenmkqg1cxevdua.xn--p1ai/files/Reestr/Company/Bezopasnost/NB%201-31.pdf>; <https://stm-group.su/about/client/ntts-reb/>;

Qinyi Electronics Co., Ltd is a Chinese company specialising in the supply of equipment and spare parts for SMT electronics manufacturing. Based in Shenzhen, it offers a wide range of components for production lines, including feeders, nozzles, motors and other spare parts for SMT equipment from various manufacturers. The company works with international clients and also provides repair and maintenance services for industrial equipment used in electronics manufacturing.

SMTtech LLC is a Russian supplier of equipment for electronics manufacturing, providing components, consumables, maintenance services, and turnkey production line solutions.³⁰ The company has provided servicing and supplied equipment to entities of the Russian defense-industrial complex, including Ryazan Radio Plant JSC and Concern Sozvezdie JSC.³¹

In Q4 2024–Q3 2025, SMTtech LLC supplied products to Enel LLC, a company involved in sourcing electronic components and equipment for Russian industry.³² Enel LLC is a direct supplier to Scientific-Technical Centre for Electronic Warfare, the manufacturer of the Pole-21 complex.

Through these activities, SMTtech LLC appears to contribute to supply chains supporting the production of Pole-21 electronic warfare systems, as high-tech equipment and components used for turnkey production lines can be applied in the assembly and testing of Pole-21 electronic warfare elements.

³⁰ ru. OOO "CMTTEX", TIN 7717754558: <https://checko.ru/company/smttekh-1137746483148#>

³¹ <https://clearspending.ru/contracts/223/66231006875150005860000>; <https://war-sanctions.gur.gov.ua/tools/company/2491>;

³² <https://checko.ru/company/ehnehl-1133668008781#contracts>;

Recommendations

Given Russia's sustained and documented dependence on foreign technology for the production and maintenance of the Pole-21 electronic warfare system, and evidence that this supply continued at least until the end of 2024, the Economic Security Council of Ukraine recommends that the government of Japan conduct a comprehensive review of its sanctions practices.

In particular, it is recommended that the Ministry of Economy, Trade and Industry (METI):

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Website: <https://reb.org.ua/en/>

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Despite Russia's stated ambitions for domestic electronics independence, Pole-21's production remains critically dependent on Western-origin components that Russia cannot manufacture at home. These include microwave integrated circuits, FPGAs, high-frequency coaxial connectors, printed circuit boards, static converters, precision measurement instruments, and SMD assembly equipment.

Between March 2024 and March 2025, coaxial cables, machinery, mechanical appliances and parts thereof, manufacturing equipment for printed circuit boards of Korean manufacturers Muhan Digital Co., Hanwha Tecnwin Co. Ltd and Emerix Co., Ltd worth a total of over USD 2 million were imported into the Russian Federation. More than half of these were direct shipments from the Republic of Korea.

Russian importers, Smtech LLC, Amitron Electronics LLC, Amitron EK LLC have long-standing ties with the Russian military-industrial complex, in particular with Scientific-Technical Center for Electronic Warfare JSC, a manufacturer of electronic warfare systems Pole-21.

Given Russia's sustained and documented dependence on foreign technology for the production and maintenance of the Pole-21 electronic warfare system, and evidence that this supply continued at least through early 2025, the Economic Security Council of Ukraine recommends that the government of the Republic of Korea conduct a comprehensive review of its sanctions practices.

In particular, it is recommended that the Ministry of Trade, Industry and Resource and Korean Security Agency of Trade and Industry:

- investigate potential violations of export control and customs regulations, including complex circumvention schemes in the supplies of equipment manufactured by the Korean companies Muhan Digital Co., Hanwha Tecnwin Co. Ltd and Emerix Co., Ltd;
- inform companies about the potential use of their equipment in the Russian military-industrial complex and encourage them to cease supplies to the Russian Federation;
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2. Production of the Pole-21 electronic warfare system in Russia

The sole developer and manufacturer of the Pole-21 system is Scientific-Technical Center for Electronic Warfare (STC) — a company specialising in electronic warfare and radio-technical reconnaissance systems.⁷

¹ <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

² <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

³ <https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

⁴ https://t.me/s/serhii_flash?before=598

<https://focus.ua/digital/557429-vs-rf-ustanavlivayut-moduli-reb-pole-21-na-domah-i-vyshkah-svyazi-zachem-eto-im-nuzhno>;

<https://topwar.ru/182196-kompleksy-rjeb-pole-21-v-rossijskoj-armii.html>;

⁵ <https://cyberleninka.ru/article/n/razrabotka-programmnogo-obespecheniya-dlya-sistem-upravleniya-ustroystv-tsifrovogo-sinteza-signalov/viewer>;

⁶ https://vpk.name/news/139106_intellekt_na_sluzhbe_pvo.html;

⁷ [ru. АО "НТЦ РЭБ" \(Акционерное общество "Научно-технический центр радиоэлектронной борьбы"\)](https://checko.ru/company/ntc-rehb-1057748002850), TIN 7731529843; <https://checko.ru/company/ntc-rehb-1057748002850>;

The main areas of activity of Scientific-Technical Center for Electronic Warfare are:

- carrying out research and development work in the field of electronic warfare (EW) on behalf of the Russian Ministry of Defence and the Russian Ministry of Industry and Trade; the development and export of EW equipment;
- development and implementation of conceptual and policy documents relating to the creation and development of the Russian Federation's electronic warfare system; the identification and implementation of innovative projects for the development of electronic warfare equipment;
- development of proposals for the creation of integrated electronic warfare systems and their integration with other means of armed combat.⁸

Research conducted by the Economic Security Council of Ukraine revealed the Scientific-Technical Center for Electronic Warfare's network of first- and second-tier suppliers.

Foreign suppliers, mainly from the PRC and Türkiye, sell Western-manufactured components to second-tier importers; these then pass on to first-tier manufacturers or distributors, who assemble components for Scientific-Technical Center for Electronic Warfare – the manufacturer of the Pole-21 electronic warfare system.

As a result, the network operates through multi-tier resale, with a predominance of distribution links at lower levels and relatively small amounts in individual transactions, which makes it possible to maintain continuity of supply whilst spreading financial risks.

3. Supply of equipment manufactured by South Korean companies to the Russian Federation

Between March 2024 and March 2025, coaxial cables, machinery, mechanical appliances and parts thereof, manufacturing equipment for printed circuit boards manufactured by the Korean companies **Hanwha Vision Co., Ltd**, **Muhan Digital Co., Ltd** and **Emerix Co., Ltd** worth a total of over USD 2 million were imported into the Russian Federation. More than half of these were direct shipments from the Republic of Korea.

Among Russian importers, **Smtech LLC**, **Amitron Electronics LLC**, **Amitron EK LLC** – have long-standing ties with the Russian military-industrial complex, in particular with Scientific-Technical Center for Electronic Warfare, a manufacturer of electronic warfare systems.

Below are detailed examples of supplies of South Korean-made products imported by companies linked to Scientific-Technical Center for Electronic Warfare.

⁸ <https://xn----7sbbigfb2afofyenmkgq1cxevdua.xn--p1ai/files/Reestr/Company/Bezopasnost/NB%201-31.pdf>; <https://stm-group.su/about/client/ntts-reb/>;

Hanwha Vision Co., Ltd. (Hanwha Techwin Co., Ltd.)

Hanwha Vision (formerly Hanwha Techwin) is a South Korean-based global leader in video surveillance and security solutions, established in 1990 and part of the Hanwha Group.⁹ The company specializes in advanced IP cameras, intelligent surveillance, and AI-powered video analytics. Hanwha Group operates across multiple industries, including aerospace and mechatronics.¹⁰

Between May and August 2024, the Russian company **SMTtech LLC** received **equipment and components for printed circuit board assembly** (HS 847989), manufactured by the Korean company Hanwha Vision Co., Ltd., with a total value exceeding **USD 950 thousand**.¹¹

It is important to note that, functionally, this equipment is directly associated with the serial production of electronic modules. Hanwha lines are used in SMT (surface-mount technology) processes, which involve the automated placement of components onto the surface of printed circuit boards and ensure high component density, parameter repeatability, and consistent quality.¹² For electronic warfare (EW) modules, high-precision assembly and inspection are essential to ensure reliability, particularly for multilayer and high-frequency boards.

SMTtech LLC is a Russian supplier of equipment for electronics manufacturing, providing components, consumables, maintenance services, and turnkey production line solutions.¹³ The company has provided servicing and supplied equipment to entities of the Russian defense-industrial complex, including Ryazan Radio Plant JSC and Concern Sozvezdie JSC.¹⁴

In Q4 2024–Q3 2025, SMTtech LLC supplied products to Enel LLC, a company involved in sourcing electronic components and equipment for Russian industry.¹⁵ Enel LLC is a direct supplier to Scientific-Technical Centre for Electronic Warfare, the manufacturer of the Pole-21 complex.

Through these activities, SMTtech LLC appears to contribute to supply chains supporting the production of Pole-21 electronic warfare systems, as high-tech equipment and components used for turnkey production lines can be applied in the assembly and testing of Pole-21 electronic warfare elements.

⁹ Hanwha Techwin Co., Ltd. officially changed its name to Hanwha Vision on March 1, 2023, <https://www.hanwhavision.com/ar/news-center/1310763/>;

¹⁰ <https://profile.hanwhavision.com/en/About.html>;

¹¹ HS codes 847989, 847990, 732690 are subjects to EU export restrictions: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02014R0833-20260116>;

¹² <https://www.hanwhasemitech.com/en/product/smt/chipmounter.asp>;

¹³ ru. ООО "СМТТЕХ", TIN 7717754558: <https://checko.ru/company/smttek-1137746483148#>;

¹⁴ <https://clearspending.ru/contracts/223/66231006875150005860000>; <https://war-sanctions.gur.gov.ua/tools/company/2491>;

¹⁵ <https://checko.ru/company/ehnehl-1133668008781#contracts>;

The deliveries were carried out by **Safir Global Kara Deniz Taşımacılığı İç ve Dış Ticaret Limited** (Türkiye) and **Qinyi Electronics Co., Limited** (PRC), as well as by Safir Global Kara Deniz Taşımacılığı İç ve Dış Ticaret Ltd. Şti., acting on behalf of **1 Click SMT Technology Co., Limited** (PRC).

Safir Global Kara Deniz Taşımacılığı İç ve Dış Ticaret Limited (Türkiye) is likely to have been involved in sanctions circumvention. Following the start of Russia's full-scale invasion of Ukraine in 2022, the company reported an increase in net sales revenue of 92,832.87%. During that period, its total assets grew by 136.94%.¹⁶

Muhan Digital Co., Ltd

Muhan Digital Co., Ltd – a Korean company specialises in the manufacture and supply of electrical cables, microwave and radio-frequency coaxial cables, optical fibre and connectors, including products that comply with the US military standard MIL-C-17.¹⁷

Between April 2024 and March 2025, the South Korean company **Muhan Digital Co., Ltd** supplied **coaxial cables** (HS 854420) of its own manufacture to the Russian Federation, worth USD **878 thousand**.¹⁸

Given the low unit cost of the products, the above-mentioned supplies can be considered essential for meeting the Russian Federation's requirements for such equipment.

The Russian importers were two affiliated companies **Amitron Electronics LLC** and **Amitron-EK LLC**.¹⁹

Amitron Electronics LLC positions itself as the only private company in the Russian Federation specialising in the development and manufacture of coaxial radio components.²⁰

Between Q3 2024 and Q2 2025, Amitron Electronics supplied products worth 170,705.51 to the **Scientific-Technical Center for Electronic Warfare**.²¹

¹⁶ https://www.emis.com/php/company-profile/TR/Safir_Global_Kara_Deniz_Tasimaciligi_Ic_Ve_Dis_Ticaret_Ltd_Sti_en_14743304.html;

¹⁷ https://gmuhandigital.gobizkorea.com/mini/site/miniSiteMain.do?domn_id=gmuhandigital;

¹⁸ HS code 854420 is subject to EU export restrictions: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02014R0833-20260116>;

¹⁹ ru. ООО "АМИТРОН ЭЛЕКТРОНИКС" (TIN 7734240231) <https://checko.ru/company/amitron-ehlektroniks-1027739858145> ; ООО "АМИТРОН -ЭК" (TIN 7733714785) <https://checko.ru/company/amitron-ehk-1097746646260#>;

²⁰ <https://web.archive.org/web/20250316092049/https://www.amel.ru/products/>; <https://www.amel.ru/>;

²¹ Trade data seen by ESCU;

There are also historical transactions in which the company supplied goods or participated in a tender for supplies to JSC “Knyrty” (4007017378), which specialises in the development of electronic warfare (EW) equipment; JSC “Bems” (3255517577), which specialises in the manufacture of electronic warfare (EW) equipment, radio monitoring and radio technical reconnaissance stations, satellite information reception and processing systems, and components for airborne radar stations.²²

The company was therefore actively involved in supplying electronic products to enterprises within the Russian military industry.

Amitron-EK supplies components for industrial automation, electrical engineering, the energy sector, and control and measurement instruments. Amitron-EK LLC was established in 2009 as a spin-off from the Automation and Electrical Engineering Department of Amitron Electronics LLC.²³

The link between the companies is also confirmed by the fact that the founder of Amitron-EK LLC is Valentyna Oleksandrivna Pigaryova – the founder of Amitron Electronics LLC.²⁴

According to public procurement records, the company supplied the following defence industry enterprises: PJSC “KOVYALKINSKY ELECTROMECHANICAL PLANT” (TIN: 1323010103), a manufacturer of radar equipment and part of the “Roselektronika” holding; JSC ‘KRASNOZAVODSKY CHEMICAL PLANT’ (TIN: 5042126251), which manufactures pyrotechnic devices and ammunition, including thermobaric warheads for Shahed-type UAVs; JSC ‘ELEKTROPRIVOD’ (TIN: 4345000922), a manufacturer of electric motors, control units and automated electric drives for military, civil and transport aviation, which, as part of a cooperation agreement for the production of the Orion UAV, supplies PBD-59V electromechanical drives.²⁵

Given the profile of Amitron-EK LLC as a supplier of industrial automation components, power electronics and control and measurement instruments, the company was able to supply Amitron Electronics LLC with the component base for the manufacture and assembly of radio-frequency and control units, which could subsequently be integrated into transceiver modules, antenna-feeder lines and control cabinets for the Pole-21 electronic warfare systems.

It is also worth noting the **importance of coaxial cables** for **Pole-21** systems.

In the Pole-21 electronic warfare system, coaxial cables and power plug connections form the core infrastructure that directly supports the operation of jamming stations. As a distributed network, modules are mounted on masts and towers, with each station housing equipment and up to three

²² <https://checko.ru/company/1027739858145/contracts/data?role=supplier;>

²³ [https://amitron-ek.ru/about/;](https://amitron-ek.ru/about/)

²⁴ <https://checko.ru/company/amitron-ehlektroniks-1027739858145#connections;>

²⁵ <https://checko.ru/company/1027739858145/contracts/data?role=supplier;>

antenna modules, while the control center may be remote. This setup requires numerous high-frequency connections between antennas, transceivers, and processing units, along with reliable power distribution in field conditions.²⁶

Design of coaxial cable effectively shields the signal from external electromagnetic interference, allows for control of signal characteristics and reduces losses at high frequencies. The quality of the coaxial path directly affects the effective isotropic radiated power (EIRP) and the receiver's sensitivity. Coaxial connectors and joints in such systems are not merely auxiliary elements, but critically important components. They ensure stable transmission of the high-frequency signal between the antenna and the microwave modules with minimal losses and a controlled level of reflection.²⁷

Given the company's specialisation in supplying electronic components, telecommunications and server equipment, **Amitron Electronics** could have acted as a system supplier of critical electronic components for the Pole-21 electronic warfare complex.

Emerix Co., Ltd.

Emerix Co., Ltd. – specialises in the development and manufacture of electronics testing equipment, in particular testers and inspection systems for printed circuit boards (PCBAs). It acts as a supplier of comprehensive testing solutions, including LCR measurement systems and diagnostic equipment, designed to enhance the accuracy and efficiency of quality control in electronics manufacturing.²⁸

In August 2024, the South Korean company **Emerix Co., Ltd** supplied **measuring instruments** (HS 9031 80) of its own manufacture to the Russian Federation, worth **USD 244 thousand**.²⁹

SMTtech LLC is a Russian supplier of equipment for electronics manufacturing, providing components, consumables, maintenance services, and turnkey production line solutions.³⁰ The company has provided servicing and supplied equipment to entities of the Russian defense-industrial complex, including Ryazan Radio Plant JSC and Concern Sozvezdie JSC.³¹

²⁶ <https://www.mennekes.org/industry/knowledge/for-electrical-engineers/norms-regulations/european-standards-for-plugs-and-sockets/>; <https://xn--b1agac13aeas4a.xn--p1ai/armament/pole-21/>;

²⁷ [https://sprotyv7.com.ua/wpcontent/uploads/2023/11/COGINT Analytic Insight Report Russian EW Systems 231119 114942.pdf](https://sprotyv7.com.ua/wpcontent/uploads/2023/11/COGINT%20Analytic%20Insight%20Report%20Russian%20EW%20Systems%20231119%20114942.pdf); https://bezpeka-veritas.in.ua/ua/p2289210494-udlinitelnyj-kabel-dlya.html?srsId=AfmBOorP67342QOjXmflnWKBxa8zGvljZsm2Q9xgurCg37DKFKS5_GS;

²⁸ <https://en.emerix.co.kr/>;

²⁹ HS code 903180 is subject to EU export restrictions: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02014R0833-20260116>;

³⁰ ru. ООО "СМТТЕХ", TIN 7717754558: <https://checko.ru/company/smttekh-1137746483148#>;

³¹ <https://clearspending.ru/contracts/223/66231006875150005860000>; <https://war-sanctions.gur.gov.ua/tools/company/2491>;

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Through these activities, SMTtech LLC appears to contribute to supply chains supporting the production of Pole-21 electronic warfare systems, as high-tech equipment and components used for turnkey production lines can be applied in the assembly and testing of Pole-21 electronic warfare elements.

Recommendations

Given Russia's sustained and documented dependence on foreign technology for the production and maintenance of the Pole-21 electronic warfare system, and evidence that this supply continued at least through early 2025, the Economic Security Council of Ukraine recommends that the government of the Republic of Korea conduct a comprehensive review of its sanctions practices.

In particular, it is recommended that the Ministry of Trade, Industry and Resource and Korean Security Agency of Trade and Industry:

- investigate potential violations of export control and customs regulations, including complex circumvention schemes in the supplies of equipment manufactured by the Korean companies Muhan Digital Co., Hanwha Tecwin Co. Ltd and Emerix Co., Ltd;
- inform companies about the potential use of their equipment in the Russian military-industrial complex and encourage them to cease supplies to the Russian Federation;
- impose export restrictions on products and equipment that could be used for the purposes of the Russian Federation's military-industrial complex specified in this document.

³² <https://checko.ru/company/ehnehl-1133668008781#contracts;>

About us

The Economic Security Council of Ukraine (ESCU) — is an independent, impact-oriented Kyiv-based institution that identifies and mitigates internal and external threats to Ukraine's economic security. The ESCU was established to strengthen the capacity of the state and civil society to resist aggression, illicit influence, and abuse in strategically important areas.

Website: <https://reb.org.ua/en/>

E-mail: secretary@escu.ua

List of annexes

Annex 1. Major South Korean Manufacturers Supplying Goods to Russian Companies Linked to the Manufacturer of Pole-21

South Korean producing company	HS code	Total value of supplies to Russia, USD (Q1 2024 – Q1 2025)	Supplier (intermediary)	Importer	A client of an import company with links to the manufacturer of Pole-21	Russian Pole-21 manufacturer (potential end user)
Hanwha Tecnwin Co. Ltd	7326909807 8479899707 8479907000	955 041,43	Qinyi Electronics Co., Ltd (PRC) Safir Global Kara Deniz Tasimaciligi Ic Ve Dis Ticaret Limited Sirketi (Turkiye)	SMTtech LLC	Enel LLC	Scientific-Technical Center for Electronic Warfare (STC)
Muhan Digital Co., Ltd	8544200000	444 296,9	Muhan Digital Co., Ltd (South Korea)	Amitron-EK LLC	Amitron Electronics LLC	Scientific-Technical Center for Electronic Warfare (STC)
	8544200000	434 169,39		Amitron Electronics LLC	-	Scientific-Technical Center for Electronic Warfare (STC)
Emerix Co., Ltd	9031803800	244 040,11	Emerix Co., Ltd (South Korea)	SMTtech LLC	Enel LLC	Scientific-Technical Center for Electronic Warfare (STC)