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CLASSIFICATION OF RADAR EQUIPMENT FOR UNMANNED AERIAL VEHICLES DETECTION

A radar is a system for detecting air, sea and land objects, as well as for determining their range, speed and geometric parameters. The specifics of solving individual tasks and their wide range led to a wide variety of different types of radars:

- by the scope of use: military and civilian;

- by the purpose: detection radars, control and surveillance radars, panoramic radars, side-view radars, meteorological radars, targeting and guidance radars, situational awareness radars;
- by the location: on-board, ground (fixed and mobile) and marine radars;
- by the type of action: passive, active with a passive response (so-called primary), active with an active response (so-called secondary) and monopulse;
- by the frequency range: radars of the metre, decimetre, centimetre and millimetre bands;
- by the number of channels: single and multi-channel;
- by the methods and modes of operation: pulsed and continuous radiation, coherent (pulse Doppler), incoherent, etc.

Pulse radars are divided into stations with simple and complex signals depending on the type of signal emitted. Complex signal can be phase-modulated, frequency-modulated or combined [1].

In NATO countries radar systems are usually divided into five broad classes. The first is air-to-air radars. They are deployed on airborne vehicles and solve the main task of detecting air targets. The second is air-to-surface radars. They are also deployed on airborne vehicles, but their main task is to detect ground targets. The third is surface-to-air radars. They are located on ground platforms and solve the main task of detecting air targets. The fourth is surface-to-surface radars. They are also located on ground platforms and their main task is to detect ground targets. The fifth is a class of functional radars. These stations can be used both on different (air and ground) platforms and solve the task of detecting air and ground targets simultaneously [2].

The main technical parameters of pulse radar stations used in physical protection systems are frequency, pulse power, antenna gain in the emission and reception modes, receiver sensitivity and signal recognition coefficient. Radars with truncated mirror or slot waveguide antennas are used to detect targets on the approaches to the protected object.

It is proposed to classify radar detection equipment according to the following classification criteria.

The first is the purpose: for detecting ground targets, air targets, multifunctional.

The second is the frequency range of the radar.

The third is the way of viewing the space: circular or sectoral.

The fourth is the type of antenna directivity characteristics and its opening angles. The ability to determine the height (angle) of the air target.

The fifth is the type of signal used (tone amplitude modulated, linear frequency modulated, etc.).

The sixth is mobility. Portable, transported on a car platform, lifted by a balloon, lifted by an octocopter, etc.

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HAZARD FACTORS OF TAILINGS IMPOUNDMENTS IN THE SIVERSKY DONETS BASIN IN THE ZONE OF ARMED CONFLICT

There are at least three hazardous industrial facilities located within the Lysychansk–Rubizhne–Severodonetsk industrial complex: storage tanks at the Rubizhansky Barvnyk LLC plant, settling tanks containing highly mineralized waste from soda ash production at the Lysychansk Soda Plant, and settling tanks at PJSC Severodonetsk Association Azot. Despite the fact that the first two enterprises have been non-operational for many years, no proper reclamation of the sites has been conducted. Even prior to the full-scale invasion, there were reports of untreated wastewater discharges through the territory of Rubizhansky Barvnyk LLC, along with evidence of increased groundwater hardness and mineralization.

The wastewater treatment facilities of Rubizhanske VUVKG discharged both untreated and partially treated wastewater—amounting to 2.075 million cubic meters in 2021. That year, violations of maximum permissible concentrations (MPC) for pollutants in wastewater were documented. In 2022, the enterprise underwent inspection due to suspicions of discharging untreated wastewater onto the territory of the defunct Rubizhansky Barvnyk LLC plant, from which it entered the Siverskyi Donets River. PJSC Severodonetsk Association Azot is one of Ukraine’s largest chemical enterprises, located in Severodonetsk, Luhansk region. The plant operates in the chemical manufacturing sector, producing ammonia, nitrogen-based fertilizers, organic alcohols and acids, household chemicals, polymer products, and polymer films. As a city-forming enterprise, its treatment facilities handle both its own industrial wastewater and the domestic wastewater of Severodonetsk. The facility had four sludge storage tanks that had been in operation for 40 to 49 years:

- Industrial wastewater sludge tank (No. 1);
- Sludge tank (No. 2);
- Decarbonization station sludge tank (No. 3);
- Physical-chemical treatment slag tank (No. 4).