

= Dnestr radar =

Dnestr radar (Russian : ?????) and Dnepr radar (Russian : ?????) , both known by the NATO reporting name Hen House are the first generation of Soviet space surveillance and early warning radars . Six radars of this type were built around the periphery of the Soviet Union starting in the 1960s to provide ballistic missile warnings for attacks from different directions . They were the primary Soviet early warning radars for much of the later Cold War . In common with other Soviet and Russian early warning radars they are named after rivers , the Dnestr and the Dnepr .

The Dnestr / Dnepr radars were intended to be replaced by the newer Daryal radars starting in the 1990s . Only two of the planned Daryal radars became operational , due to issues such as the dissolution of the Soviet Union . As of 2012 , the Russian early warning network still consists of some radars of this vintage . It is likely that all the existing radars will be replaced by the third generation Voronezh radars by 2020 .

= TsSO @-@ P =

The Dnestr radar came from work on ballistic missile defence undertaken in the late 1950s and early 1960s . System A , the prototype for the A @-@ 35 anti @-@ ballistic missile system , was set up in the Sary Shagan testing grounds , in the Kazakh SSR . : 123 Work on the system was led by design bureau KB @-@ 1 which proposed using VHF radar RTN (Russian : ???) and the Dunay @-@ 2 UHF radar . Other alternatives were sought from Soviet industry and RTI proposed using VHF radar TsSO @-@ P (Russian : ??? @-@ ?) and UHF radar TsSS @-@ 30 (Russian : ??? @-@ 30) .

TsSO @-@ P (standing for Russian : ???????????? ???????? ????????????? ? ???????????? meaning central detection station ? test site) was selected for further development , together with the Dunay @-@ 2 . TsSO @-@ P had a long horn antenna 250 metres (820 ft) long and 15 metres (49 ft) high . It had an array with an open ribbed structure and used 200 microseconds pulses . Hardware methods were designed for signal processing as the intended M @-@ 4 computer could not run . It was built at area 8 in Sary Shagan and was located at 46 ° 00 ' 04 " @. 65 ' N 73 ° 38 ' 52 " @. 11 ' E . It first detected an object on 17 September 1961 .

TsSO @-@ P took part in the 1961 and 1962 Soviet Project K nuclear tests tests above the Sary Shagan range to examine the effects of high altitude nuclear explosions on missile defence hardware .

= Dnestr =

TsSO @-@ P was effective at satellite tracking and was chosen as the radar of the Istrebitel Sputnik (IS) anti @-@ satellite programme . This programme involved the construction of two sites separated in latitude to form a radar field 5 @, 000 kilometres (3 @, 100 mi) long and 3 @, 000 kilometres (1 @, 900 mi) high . The two sites chosen were at the village of Mishelevka near Irkutsk in Siberia , which was called OS @-@ 1 , and at Cape Gulshad on Lake Balkhash near Sary Shagan , which was called OS @-@ 2 . Each site received four Dnestr radar systems in a fan arrangement . : 421 : 433

A Dnestr radar was composed of two TsSO @-@ P radar wings joined together by a two story building containing a joint computer system and command post . Each radar wing covered a 30 @-@ degree sector with a 0 @. 5 degree scanning beam . The elevation scanning pattern was a ' spade ' with a width of 20 degrees . The radar systems were arranged to create a fan shaped barrier . Of the four radars , called cells (Russian : ??? , tr . RLYa roughly radio location cell) , two faced to the west and two faced to the east . All scanned between + 10 degrees and + 90 degrees in elevation .

Construction at the two sites started between 1962 and 1963 with improvements in the TsSO @-@ P test model being fed back into the deployed units . They gained an M @-@ 4 2 @-@ M computer with semiconductors , although the rest of the radar used Vacuum tubes . The radar systems were

completed in late 1966 with the fourth Dnestr at Balkhash being used for testing . In 1968 the Dnepropetrovsk Sputnik target satellite , DS @-@ P1 @-@ Yu , was used to test the ability of the system .

The Dnestr radars were accepted for service by the Soviet Air Defence Forces in April 1967 and became part of the space surveillance network SKKP . : 434

= = Dnestr @-@ M = =

Parallel with the implementation of the Dnestr space surveillance units , a modified version of the original Dnestr units , Dnestr @-@ M radar , was being developed to act as an early warning radar to identify attacks by ballistic missiles . The first two were built at Murmansk in northern Russia (Olenegorsk ? RO @-@ 1) and near Riga in the then Latvian SSR (Skrunda ? RO @-@ 2) . They constituted the beginning of the Soviet SPRN network , the equivalent of the NATO BMEWS . : 421

The first Dnestr @-@ M at Olenegorsk was completed by 1968 . In 1970 , the radars at Olenegorsk and Skrunda , and an associated command centre at Solnechnogorsk , were accepted for service . According to Podvig (2002) , it seems they were positioned to identify missile launches from NATO submarines in the Norwegian and North Seas .

The Dnestr @-@ M included many improvements over the previous versions such as an increase in the pulse length from 200?s to 800?s which increased the range of objects identified , more semiconductors , and many other scanning and processing changes .

A version of this radar was built at the Sary Shagan test site and was called TsSO @-@ PM (Russian : ??? @-@ ??) . After this had completed tests in 1965 it was decided to upgrade nodes 1 and 2 of the two OS sites to Dnestr @-@ M , keeping nodes 3 and 4 as Dnestr . These radars remained as space surveillance radars which scanned between + 10 and + 90 degrees , comparative to scanning between + 10 and + 30 degrees for the missile warning radars . A space surveillance network of four Dnestrs and four Dnestr @-@ Ms , and two command posts was formally commissioned in 1971 .

= = Dnepr = =

Work to improve the radar continued . An improved array was designed which covered 60 degrees rather than 30 . The first Dnepr radar was built at Balkhash as a new radar , cell 5 . It entered service on 12 May 1974 . The second was a new early warning station at Sevastopol . New Dneprs were also built at Mishelevka and another at Skrunda , and then one at Mukachevo . The remaining radars were all converted to Dnepr with the exception of cells 3 and 4 at Balkhash and Mishelevka which remained space surveillance radars . : 422

All current operational radars are described as Dnepr , and have been updated incrementally .

= = Technical details = =

Each Dnepr array is a double sectoral horn antenna 250m long by 12 m wide . It has two rows of slot radiators within two waveguides . At each end of the two arrays , there is a set of transmitting and receiving equipment . It emits a signal covering a sector 30 degrees in azimuth and 30 degrees in elevation , with the scanning controlled by frequency . Four sets mean the radar covers 120 degrees in azimuth and 30 degrees in elevation (5 to 35 degrees) .

The Dnepr involved the horn antenna being reduced from 20 to 14 metres in height and the addition of a polarising filter

= = Current status = =

These radars have been installed at six different radar stations and as of 2012 are operational at three ? Balkhash , Mishelevka and Olenegorsk . The 1972 Anti @-@ Ballistic Missile Treaty required that early warning radars were located on the periphery of national territory and faced

outwards . This caused problems when the Soviet Union collapsed in 1991 as many of the radar stations were now in newly independent states . The first station to close was Skrunda , in newly independent Latvia . A 1994 agreement between Russia and Latvia agreed that the two Dnepr radars there would stop working in 1998 , and would be fully demolished by 2000 . : 129 : 65 : 426

Russia signed an agreement with Ukraine in 1992 allowing it to continue using the Dnepr radars at Sevastopol and Mukachevo . The stations were run by Ukrainian personnel and data was sent to the headquarters of the Russian early warning system in Solnechnogorsk . In 2008 Russia announced that it was pulling out of the agreement with Ukraine and that the last data given to Russia from the stations would be in 2009 . : 76 The Ukrainian government announced that the stations were to be used part @-@ time for space surveillance .

The station in Balkhash in Kazakhstan remains the only Dnepr operational outside Russia . It has been modernised and is run by the Russian Aerospace Defence Forces .

The remaining stations in Russia are due to be replaced by the Voronezh radar . The Dneprs in Mishelevka , Irkutsk will close once the second array of the new Voronezh radar is operational . The Dnepr at Olenegorsk , Murmansk will be replaced by a Voronezh as well . It is planned to start construction there in 2017 .