

## Nuclear command, control and communications systems

From recent contracts it is possible to establish that the Russian Defence Ministry are maintaining and upgrading sophisticated and complex command, control and communications networks. }

### **Early Warning System Crocus**

*Crocus*

The space research institution Vimpel developed Crocus (Крокус), a system for disseminating and displaying early warning information about any missile attack on the Soviet Union.<sup>1</sup> Crocus became operational in 1976. It provides central command posts of the General Staff, SRF, Navy and Air Force with satellite and radar data on any incoming missile attack.

In 2009 Vimpel introduced an upgraded system, Крокус-УР.<sup>2</sup> Contracts were placed with Vimpel for early warning display system 90A6-УР and it can be assumed that this is part of Крокус-УР. These contracts show that the modernised system is installed at Solhenogorsk-7 (~~Space Forces headquarters~~), Kolomna-1 (~~Space Forces communications~~), Kitlim (SRF command centre, Kosvinsky Mountain) and Chekhov (unit 10926).<sup>3</sup> It is likely that the upgraded version of Crocus will be deployed at other central command centres and space force units. АКСР

90A6-УР is designed to be in continuous operation. It can receive details of a missile attack through dedicated communications channels and it can map data using 6 "information models".<sup>4</sup> There is a slight difference between the variants of 90A6-УР which are installed at Space Forces sites and command posts.<sup>5</sup>

In 2009 the telephone exchange system for Crocus was modernised.<sup>6</sup>

### **Authorisation System Kazbek**

Kazbek is the system for authorising the use of nuclear weapons. It is the network through which permission is granted by the political leadership to the military. Kazbek enables the senior leadership to consult with each other, wherever they are, and then to convey their permission to central command posts. Kazbek does not issue automated commands to launch nuclear missiles. This can only be carried out by the military.

Kazbek has three components: Cheget, Kavkaz-7 and Baksan. Authorisation for a nuclear attack is conveyed by the President and Defence Minister from their Cheget suitcases, through the Kavkaz-7 communications system, to Baksan terminals at central command posts.

Kavkaz is the Russian for Caucasus. Cheget and Kazbek are both peaks in the Caucasus mountains.

<sup>1</sup> Yarynich, p151; <http://www.vimpel.ru/rko5.htm>

<sup>2</sup> [http://www.vimpel.ru/2010/protocol\\_1\\_%2029.06.2010.doc](http://www.vimpel.ru/2010/protocol_1_%2029.06.2010.doc)

<sup>3</sup> Contact for 90A6-УР spare parts for Solhenogorsk-7, Kolomna-1 and Chekhov - <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=366138>; Contract for installation of 90A6-УР at Kitlim - <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=345653>

<sup>4</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=345653>

<sup>5</sup> The data transmission component at Chekhov and Kitlim is 81A6M-H, whereas Solhenogorsk-7 and Kolomna-1 have 81A6M-B. A display and control subsystem, КОУ-Н BCYE, is installed in the two command posts, but it is not included in the list of spare parts for the two Space Forces sites.

<sup>6</sup> [http://www.tssonline.ru/newstext.php?news\\_id=65091](http://www.tssonline.ru/newstext.php?news_id=65091)

## Cheget

The Russian President is constantly escorted by an officer who carries a special suitcase, Cheget. This contains equipment to connect the President to the Kavkaz communications system. Two other suitcases are kept with the Defence Minister and the Chief of the General Staff.

## Kavkaz-7

The largest part of Kavkaz is the complex communications system Kavkaz-7. The General Staff operate a number of communications networks called Kavkaz. Kavkaz-7 is the communications system for authorising the use of nuclear weapons and for high level consultation about their release. Kavkaz-7 was originally developed by Vladimir Semenikhin, who also designed the Centre automated command system.

The alphanumeric designation for Kavkaz-7 is 65c37.<sup>7</sup> 65c37 is described as a "special automated command system". It is being modernised and the new version is 65c37-M. There are also proposals for a further upgrade, 65c37-2.<sup>8</sup>

Kavkaz-7 includes control posts (65c27), facilities at Presidential residences, transmitters in Moscow, communications vehicles and airborne relay stations.

### *Fixed control posts (65c27)*

65c27 is the control system at the heart of Kavkaz-7. There are eight numbered control posts with automation and telegraphic switching equipment.<sup>9</sup> One contract gives the general location of seven of these - four are in Moscow, two in Chekhov region and one in Penza region.<sup>10</sup> It can be assumed that the equipment in Penza region is in Kutznetsk-8. One of the sites in Chekhov region will be Chekhov-3. Two of the Moscow facilities, Objects 320 and 2486, are in Komsomol Street and Tverskaya Street. As this system is critical to nuclear warfare, ~~all~~ of the 65c27 control posts will ~~all~~ be underground. ]

The original control units, 65c727, were built between 1985 and 1987. A revised system, 65c727M1, was installed at Object 2486 in 2002 and entered service in 2004. A further modification, 65c727M1-02, was installed at three sites between 2005 and 2009 and then at Object 320 in 2010. There were proposals to upgrade Object 2486 from 65c727M1 to 65c727M1-02.<sup>11</sup> The next stage of modernisation, 65c727M1-03, is being planned.<sup>12</sup>

The earliest part of the upgrade was installed in 2002. This coincided with the revival in work at the Automated Equipment Institute. There was a gap of two or three years between when equipment was installed at each site and when it was fully operational. There has been a significant delay in implementing the project in full. In 2011 three of the eight sites will still be operating with equipment from the 1980s.

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<sup>7</sup> <http://doc.gostorgi.ru/7/2009-06-09/398698/1.doc>

<http://zakupkiold.gov.ru/Notification.aspx?PurchaseId=398920>

<http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=697656>

<http://doc.gostorgi.ru/7/2010-03-01/697656/1.rtf/>

<sup>8</sup> <http://doc.gostorgi.ru/7/2009-06-26/420191/3.doc>

<sup>9</sup> "КСА и КТС" <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=398294>

<sup>10</sup> <http://zakupkiold.gov.ru/Notification.aspx?PurchaseId=398294>

<http://zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=398155>

<sup>11</sup> The upgrade of Object 2486 to 65c727M1-02 was in the 2009 contract, but not the 2010 contract.

<http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=399568>

<sup>12</sup> The installation of 65c727M1-02 at Object 320 is to be done in a way that takes account of the future upgrade to 65c727M1-03.

The relationship between 65c27 and Summit, the highest level of the Centre automated command system, is unclear. The two systems may be related.<sup>13</sup>

### *Presidential residences*

There is Kavkaz-7 communications equipment at the main facilities of the Russian President and other members of the leadership. There are two similar Kavkaz-7 systems at these sites. K5111 is installed in permanent offices and K5112 is in holiday retreats.<sup>14</sup> There are approximately 14 locations with K5111 or K5112.<sup>15</sup> The oldest units were installed in 1982 and are now being replaced. Four units were installed since 2000 and some of these may be at new holiday sites.

There are at least two K5111 systems in the Kremlin. An order was placed in 2009 for new K5111 units for K735-1 and K735-2. The location for this work is given as GON. This is the Special Purpose Garage, part of the Presidential Protection Group, in the Kremlin.

There are two identifiable K5111 units in a Defence Ministry site.<sup>16</sup>

The following Presidential retreats are known to have Kavkaz-7 equipment:

- Kostinopolsky Palace, Strelna. Official Presidential residence in Saint Petersburg
- Zavidovo. Presidential retreat in a nature reserve North of Moscow
- Valdai. Presidential residence between Moscow and Saint Petersburg
- Sochi. Presidential summer residence on the Black Sea
- Kislovodsk. This area has been used as a retreat by the Russian leadership.<sup>17</sup>

### *Mobile communication system (Kavkaz-7M10)*

Equipment for Kavkaz-7 has been supplied to Moscow University and Ostakino.<sup>18</sup> There are many antennae on the spire of the University main building and on the Ostakino Tower television mast.

The two main radio stations for Kavkaz-7M10 are Message and Message-1.<sup>19</sup> Message is in Ostankino Tower and Message-1 is in the University.<sup>20</sup> There is a reference to improving the range of Message and Message-1 from "300 to 400".<sup>21</sup> The unit of measurement is not stated, but is probably kilometres.

The main exchange for Kavkaz-7M10 is Cypress. This is in facility K750. Equipment for K750 is delivered to Komsomol Street, probably Khamovnichesky barracks. K750 is adjacent to Object 320.

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<sup>13</sup> The upgrade of 65c27 in Object 320 coincided with the introduction of the upgrade of Summit in the same facility.

<sup>14</sup> Contract for delivery of special communications systems, published 25/10/2007.

<sup>15</sup> A maintenance list for 2009-10 lists the age and location of K5015 units which are the main components. 13 sites beginning with the letter K are listed. In two cases, K735 and K738, the sites have two sets of equipment. The list does not include K711 which also has two sets of equipment.

<sup>16</sup> K711-1 and K711-2 are in A3 MO PΦ; <http://zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=692393>

<sup>17</sup> K5112 complexes were ordered for Saint Petersburg (Strelna) and Sochi.

<http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=401621>

Kavkaz-7M10 equipment was ordered for Klin (Zavidovo) and Ostakino. Antenna amplifiers were ordered for Zavidovo, Strelna and Kislovodsk. <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=398920>

<sup>18</sup> Moscow University and Ostakino are both listed in orders placed in 2009 and 2010 for equipment for Kavkaz7M10 and in 2009 for antenna amplifiers.

<sup>19</sup> Vimpel means message.

<sup>20</sup> One package of work was on Vimpel, Vimpel-1, K750 and Topol-K7M10 at Ostinkovo, Moscow University and K750. <http://doc.gostorgi.ru/7/2010-03-01/697656/1.rtf/>

<sup>21</sup> <http://doc.gostorgi.ru/7/2010-03-01/697656/1.rtf/>

A second Kavkaz-7M10 site which is mentioned in contracts is ВОЙСКОУ ЗНАМЕНСКИ ЛАГЕР. This is the address of the Head of Military Communications, next to the old General Staff building. There is probably a second exchange for Kavkaz-7M10 in this vicinity.

Contracts were placed in 2009 and 2010 for the maintenance of several types of radio-centres: 48 sets of Клен-ДЦ, 20 sets of Клен-ЯЦ 27 sets of Сосна-В and 13 sets of Сосна-М.

### *Vehicles*

A number of cars are fitted with communications systems for the Russian leadership. At least 24 of these "leadership vehicles" have recently been modified.<sup>22</sup> The description of this work shows that each vehicle has three mobile radio systems – Kavkaz-7, Kavkaz-9/Kavkaz-4 and Karat-R. Kavkaz-4 is a VHF communications system in the Moscow area.

### *Airborne systems*

A special version of the Ilyusin-22 aircraft, Ил-22К, operates from Chkalovsky, a military airfield East of Moscow. This aircraft carries a radio relay system, БКРП К7, which is part of Kavkaz-7. The performance of this relay system was analysed and improvements ordered in 2009 and 2010. This work was included in the 65c37 contracts.

Another special aircraft at Chkalovsky is Ilyusin-62 number 86572. This carries an airborne satellite control station, Asteroid 1-S, which is part of Kavkaz-7. In 2010 work was commissioned to monitor and improve this system.

The Russian President has two Ил-96ПУ aircraft.<sup>23</sup> The suffix ПУ stands for command post. One contract refers to a system (КБ162) on a "large moving object". This may be the Kavkaz-7 equipment on these aircraft. (a land air)

There is Kavkaz-7 equipment on Tu-154 and Tu-134 aircraft which are used by the military high command. This is evident from an order for a new airborne satellite communications system, Soldier (Армеец), which will be installed on these aircraft.<sup>24</sup> Армеец will provide communications for the top military leadership, including video-conferencing, internet access and participation in the Kavkaz-7 network. It will maintain contact with military communications satellites in geostationary and high elliptical orbits and with several ground stations.<sup>25</sup> The systems will be designed to resist jamming and to take account of the effects of nuclear explosions.

### Baksan

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<sup>22</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=398788>

<sup>23</sup> Aircraft numbers 96012 and 96016. President Medvedev would like to order two additional aircraft.

<sup>24</sup> <http://doc.gostorgi.ru/7/2009-06-26/420191/3.doc>

<sup>25</sup> It will work with Geostationary satellite systems Глобус-1, Глобус-1М and Сфера and with High Elliptical Orbit satellite systems Меридиан and Диагональ. The main ground station system that it will relate to is Ливень-ВМ, but it will also be designed to work with Легенда-МД, Кулон-ВМ, Форејтор, Лава-1, Лавина and Фараон.

messages concerning the use of nuclear weapons are received on Baksan terminals. Baksan is installed at command posts of the General Staff, Strategic Rocket Forces, Navy and Air Force.

There is a reference to Baksan in a list of work performed by the Academician VS Semenkina Research Institute in 2009.<sup>26</sup> This says that the institute was awarded a contract for repair and maintenance work on “the control subsystem Baksan”.

### **Command and control systems**

There are three methods of transmitting command messages to the ICBMs of the Strategic Rocket Forces. The main system is Signal. Signal messages are automatically relayed down a hierarchy of command posts. Within Signal there is a back-up system called Blizzard. Blizzard orders are transmitted directly to regimental command posts. The third system is Perimeter. In certain situations a Radio Command Post can order the launch of Perimeter rockets. These rockets transmit orders by radio to ICBM launch pads.

Recent contracts provide a detailed description of Monolith (257L). This handles the transmission of Signal messages at the highest command level. It is possible that Monolith (257L) only processes the earlier form, Signal M, and not the later version, Signal A.

The General Staff developed the Centre automated command system (КСБУ). This is used for nuclear and non-nuclear operations. Centre can process some SRF command functions within General Staff Central Command Posts. However detailed instructions from both General Staff and SRF command posts to SRF units are transmitted through Signal. Naval and Air Force nuclear operations are handled to a greater extent within Centre. In addition the Navy uses the Sea automated command system and the Air Force uses the Wing automated command system.

### Signal

Signal is the Strategic Rocket Forces (SRF) automated command system. Missiles can be launched automatically from Central Command Posts of the General Staff and SRF. The Signal system can also increase or decrease the alert status of missile units. The earliest version of Signal was developed in the late 1960s. This evolved into Signal M during the 1970s.<sup>27</sup> The next stage was to upgrade Signal so that central command posts could carry out more complex retargeting. A modified system, Signal A, was deployed in 1985 and became the primary method of controlling SRF forces. Missiles can be launched within 30 seconds of the order being issued at a central command post. Signal A provides feedback on the detailed status of the missile force to SRF and General Staff headquarters. Signal A makes use of all earlier communications systems and is interfaced with Signal M. A new version, Signal A1, is under development.

There are references to the older term, Signal M, in recent contracts for SRF equipment and for the Monolith (257L) command system.

The automated launch equipment for Signal is fitted in General Staff Command Posts as well as SRF Command Posts. Signal uses a wide range of communications methods – radio, satellite and cable. Instructions are conveyed down a hierarchy of command posts – Army (3<sup>rd</sup> level) - Division (4<sup>th</sup> level) - Regiment (5<sup>th</sup> level) - Missile launchers (7<sup>th</sup> level). In the normal operating mode these intermediate headquarters are only automated relay stations, passing on launch orders and missile status data. The system can be adjusted so that launch control is delegated to Army, Division or Regimental headquarters.

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<sup>26</sup> <http://top.qtender.ru/91548.html>

<sup>27</sup> Yarylich page 142f

contracts. These contracts provide detail of some elements of Signal. However, they only give a glimpse into what is a large and complex system.

One particularly interesting contract was placed in 2009.<sup>28</sup> It included 6 lots:

Lot 1 was antenna masts, АМУ-5, for 3 missile divisions.

Lot 2 was “indicators for Signal M”. These were supplied to SRF headquarters, Odinstovo-10, and to the three missile armies. The initial order was for 6,000 indicators, but this was reduced to 3,000.

Lot 3 was spare parts for 15Э343. These were supplied to 3 missile divisions. 15Э343 is described as “apparatus level 4M АСБУ Signal.”<sup>29</sup> A history of the command and control department of the Serpukhov Missile Academy refers to the installation of Signal-4M control equipment in the Academy in the late 1990s.<sup>30</sup> This would appear to be level 4 (divisional headquarters) of the Signal M system.<sup>31</sup>

Lot 4 was display equipment 15Э961 for SRF headquarters, Odinstovo-10, and the three army headquarters.

Lot 5 was equipment for facility 15B221 in SRF headquarters, Odinstovo-10. The order included 43 protected telephones (П-171Д), 28 HF radios (Р-170П-УУ КВ), 12 encryption systems (Т-230-1АМ-14) and other communications, telegraphy and exchange components which cannot be readily identified. The list included three 15Э1 systems. The first was 15Э1394. This organises the exchange of information between mobile, fixed and hardened command posts.<sup>32</sup> Two were ordered for facility 15B221. The second was an HF radio system, 15Э1389.<sup>33</sup> Additional 15Э1389 systems were ordered for SRF headquarters in other contracts. These radio systems were also supplied to two army headquarters and five divisions. The third was a communications system, 15Э1391, which is described below.

Lot 6 was spare parts for 15Э601 (Perimeter). This is described later.

A key factor in Signal is the ability to monitor the status of communications links, identify where the system has failed and re-route messages accordingly. This is primarily to cope with the situation where transmitters and exchanges have been disrupted by nuclear explosions. Several recent contracts refer components which are designed to maintain communications through identifying the surviving channels which provide the best capacity.

15Э1391 (Байонет-Р) operates within automated telegraphic exchanges. It has several components. 15Э1391-4 is installed in Divisional command posts (4<sup>th</sup> level). It is designed to “automate tasks for operational planning” and to retain communications links. It also gathers information on the state of the communications system and passes this up to higher levels. The Defence Ministry ordered 15Э1391-4 for 4 missile divisions in 2009. 15Э1391-3-2 is a similar product which operates at SRF Army command posts

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<sup>28</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=255576>

<sup>29</sup> “аппаратуры звена 4М АСБУ «Сигнал-М»”

<http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=255576>

<sup>30</sup> “аппаратуры АСБУ «Сигнал-4М»” <http://svirvmo.ru/>

<sup>31</sup> There are unconfirmed online references to 15Э781 as equipment for Signal M level 6 and to 15Э1557 as equipment for Signal A level 7 (launchers).

<sup>32</sup> <http://www.army.informost.ru/2010/sbornik/3-30.php>

<sup>33</sup> “комплекс технических средств каналов КВ радиосвязи с широкополосными сигналами ‘Бриолит’” <http://zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=248684>

(С 1000). Two other components are 15Э1841 and 15Э1842. A total of 39 of these elements were ordered in 2009. Most were for SRF central command posts - 21 for Odintsovo-10 and 13 for Balabanovo.

A related product is 15Э1841 (Баллиста). This is described as "control equipment" and "equipment for testing communications channels". It is also called part of "СБУ ПБСН", the SRF combat command system. 15Э1841 assists in maintaining links between parts of this system. It also enables classified video conferencing to take place between command posts. Components of 15Э1841 have recently been installed at the SRF central command post, Odintsovo-10, and in all Army and Divisional command posts. 15Э1841 has also been installed in the SRF command post at Kitlim.

Soliton are a company which produces electronic components. They have developed more effective systems for retaining communications through cable, radio and satellite systems.<sup>34</sup> Two of their current products, 15Э1383 and 15Э1839, were recently ordered for two missile divisions and for the missile range impact area at Klyuchi in Kamchatchka.

The SRF recently introduced a new system, 15Э1835 (Буссоль), which was designed to maintain communications in the face of jamming and electronic warfare. This equipment was supplied to 6 missile divisions.

Nuclear command messages are transmitted using various communications methods in Signal. One of these is satellite communication. Contracts were placed to maintain the Корунд-М1 satellite ground station in Naro-Fominsk-5. 15Э1862 (Критик) is an automated satellite communications system for SRF. Components for 15Э1862 were supplied to the town of Gagarin in Smolensk. Satellite communications equipment 15Э1305 (Рундук-С1) was supplied to the 54<sup>th</sup> missile division.

There is a record of the 27<sup>th</sup> Army in Vladimir receiving spare parts for 15B222. This is the communications system installed in the hardened command posts (УКП) at Topol-M missile sites. The components listed included signal generators for LF, HF and VHF along with receivers and power supply units. Also in this contract were systems which automatically organise communications channels and others which process and decrypt coded messages. In addition, the 27<sup>th</sup> Army has received a new system for measuring the effective range of radio transmissions, 15Э1392 (Барограф).

### Blizzard

Blizzard is a sub-system of Signal. It provides a back-up means of radio communications. Unlike Signal, Blizzard transmits directly from Central Command Posts to Regimental headquarters. It does not rely on Army and Divisional command posts automatically relaying messages, although these intermediate stations can receive them. Blizzard uses HF, VLF and satellite communications. Automated commands which are sent through Blizzard can be executed by Signal equipment at SRF command posts.

Blizzard is a one-way communications system. Acknowledgments that messages have been received cannot be transmitted through Blizzard itself. The Monolith (257Ц) system, described below, can pass these Blizzard acknowledgements back to Central Command Posts.

### Monolith (257Ц)

Published contracts provide detailed information on one part of the nuclear command system. Two terms are used for this system, Monolith and 257Ц. Monolith was the name of the earliest Soviet nuclear

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<sup>34</sup> <http://www.army.informost.ru/2010/sbornik/3-64.pdf>

command structure. The current Monolith system is for Signal messages. One of the contract documents uses the term Signal M.<sup>36</sup>

This Monolith (257Ц) system does not appear to issue Blizzard orders. However when Blizzard orders are received the acknowledgements are passed through Monolith to General Staff Command Posts.

Signal messages are distributed within Level One of Monolith and are passed down to Level Two. Level one includes the Command Posts and Mobile Command Posts of the General Staff, along with a number of relay centres. The published information does not define the level-two command posts of Monolith, but these may include missile Army headquarters. It is not clear if SRF command posts are within level one or level two of this system.

There is some ambiguity over whether Monolith issues instructions to Naval and Air Force nuclear units. The term Signal M is normally only used for the SRF. However, two of the relay posts for Monolith are naval communications units in Kaliningrad.

There are four main components of 257Ц:

- 257Ц21 – at 5 static command posts (257Ц21)
- 257Ц22 – at 3 telegraphic centres
- 257Ц23 – at 2 radio transmission centres
- 257Ц24 – at 32 reception and retransmission centres

In addition the system maintains contact with 2 radio reception centres and 4 mobile command posts.<sup>37</sup> The latter may be three of the four Il-80 nuclear command aircraft and the rail-mobile command post.

This Monolith (257Ц) system has recently been upgraded and modernised. The contracts for this work were placed with the “Integral” Institute at Mytishchi, North East of Moscow and this is noted on the institute’s website.<sup>38</sup>

#### *Static Command Posts (257Ц21)*

257Ц21 is installed in five static central command posts.<sup>39</sup> The approximate locations of three of the facilities can be identified. Object 595Б is operated by Unit 10926 in Chekhov region, probably in Chekhov-3. Objects 423Б and 666Б are in Moscow. Both are components of Rubin, the first communications node of the General Staff. The locations of the remaining two objects, 210Б and 253Б, are not known. It is likely that one of them is in the Alternative General Staff Command Post, Kuznetsk-8.<sup>40</sup>

The fifth static command post may be either the Central Command Post of the SRF at Odintsovo-10, or an additional General Staff Command Post.

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<sup>35</sup> Before the Soviet Union acquired nuclear missiles the term Monolith was used for a military command system which incorporated both cable and radio communications.

<sup>36</sup> The contract for 257Ц24 describes how Signal M messages pass through the system. The contract for 257Ц22 repeats this description, but uses a more general term, Signal БУ. (БУ - боевого управления – Combat Control). Signal M are a type of Signal БУ. Signal M is described as АСБУ, ie an automated system of combat control.

<sup>37</sup> The two HF radio reception stations are only identified as radio networks KB9 and KB19.

<sup>38</sup> <http://www.army.informost.ru/2007/firms/integral.html>

<sup>39</sup> СПУ - стационарный пункт управления – Static Command Post

<sup>40</sup> The telegraphic centre component of 257Ц is installed in Kuznetsk-8, so the facility probably also hosts the command post component.



257Ц21 is also called Монолит-АС-ПС. It has been upgraded and the new version is 257Ц21-М-01.

### *Telegraphic Centres (257Ц22)*

257Ц22 is at 3 telegraphic centres.<sup>41</sup> These are in Object 423Б (Moscow), Object 595Б (Chekhov) and Object 250Б (Kuznetsk-8).<sup>42</sup> A contract was issued in 2009 for installing the latest version, 257Ц22-М-01, at all three sites.

257Ц22 automatically relays signal БУ messages from Central Command Posts to “correspondents of the first command level”, including Reception and Retransmission Centres (257Ц24). It also forwards to Central Command Posts acknowledgements, from the first and second command levels, of signal БУ messages and of orders transmitted through the Blizzard system.

Each 257Ц22-М-01 system has 48 channels. These are allocated as follows: 2 to each of the 5 Static Central Command Posts (257Ц21), 1 to each of 4 Mobile Command Posts, 1 to each of 32 to Reception and Retransmission Centres (257Ц24), 1 for telegraph control and 1 spare.

### *Radio Transmission Stations (257Ц23)*

257Ц23 systems are in HF radio transmission centres.<sup>43</sup> They are at two unidentified sites – Object 151Б and Object 567Б.<sup>44</sup> These are also referred to as radio networks KB1 and KB2. Each of the 32 retransmission centres (257Ц24) can remotely control these two transmitters.

The current version of this system is 257Ц23-М-01. It is also called Монолит-АС-РЦ.<sup>45</sup>

### *Receiving and Retransmission Centres (257Ц24)*

257Ц24 are systems for receiving and retransmitting messages.<sup>46</sup> One contract indicates that there are 32 centres for 257Ц24. In two cases there are A1 and A2 centres. This suggests the system is installed at 30 sites. Some of the 257Ц24 equipment is co-located with other elements of the Monolith system.<sup>47</sup> The number of sites with only 257Ц24 equipment is between 14 and 24.

A contract for the latest version of this system, 257Ц24-М-01, names five of these centres.<sup>48</sup>

- The Communications Centre of the Armed Forces Logistics (Rear) headquarters at 41 Leningradinsky Prospect, Moscow.<sup>49</sup>
- The 69th communications centre. This signals unit is either in Moscow or Selatino, which is between Moscow and Naro-Fominsk. It comes under the jurisdiction of the Head of Armaments in the Armed Forces and may previously have been a signals unit for Moscow military district.

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<sup>41</sup> ТГЦ - телеграфный центр

<sup>42</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=464956>

<sup>43</sup> ПДРЦ - передающий радиоцентр

<sup>44</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=436593>

<sup>45</sup> Монолит-АС-РЦ

<sup>46</sup> ППР - пункт приема и ретрансляции

<sup>47</sup> Two channels in the 257Ц24 system are allocated to either a mobile command post or a receiving radio station which would be a sensible arrangement if some of the 257Ц24 systems were in the mobile command posts and receiving stations.

<sup>48</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=464845>

<sup>49</sup> УС тыла ВС РФ

- Unit 11958 Naro Fominsk. This communications unit is associated with both Selatino and Bekasovo, which is near Naro Fominsk. The Bekasovo site is more likely as it may be the location of a command bunker.
- Unit 40129 Kaliningrad. This is a naval communications unit in the Russian enclave between Poland and Lithuania. It probably has access to the VLF transmitter in Kaliningrad, which can communicate with nuclear submarines.
- Unit 95154 Kaliningrad. This is a second naval communications unit with access to the VLF transmitter. Unit 95154 is also responsible for the Kaliningrad regional exchange of the Centre automated command system.

The description of 257Ц24 refers to main and spare centres. In each case there is an A and a Б centre, with the latter marked in brackets. The Б centres are probably spare sets of equipment at the same sites.

Each 257Ц24 system has 32 channels. The normal allocation is: 1 to each of the 3 Telegraphic Centres (257Ц22), 1 to each of 2 Radio Transmission Centres (257Ц23), 1 to another Reception/ Retransmission Centre (257Ц24), 1 to each of 4 Mobile Command Centres, 1 to each of 2 Receiving Radio Centres, 17 to “correspondents of the second command level”, 1 for telegraph control and 1 spare.

Each centre with 257Ц24 receives Signal M messages from Static Command Posts (257Ц21), via Telegraphic Centres (257Ц22), and relays them to the second command level. Each 257Ц24 system can also generate its own messages which are relayed through the two Radio Transmission Centres (257Ц23), which they can automatically control.

257Ц24 also handles acknowledgements of these Signal M messages and of orders sent through the Blizzard system. It relays these acknowledgements from the second command level to the Telegraph Centres (257Ц22).

257Ц24 is also called Монолит-АС- ППР.

### Centre

Centre is the primary automated command system for the Russian Armed Forces.

Vladimir Semenikhin, at the Automatic Equipment Research Institute in Moscow, was the principal designer of automated systems for the Russian military. In the 1970s he developed Centre, an overall command and control system (КСБУ).<sup>50</sup> Centre is used to control strategic nuclear forces, particularly those of the Navy and Air Force. While Centre can play some role in the command of the SRF, detailed control of the ICBM force is primarily through another system, Signal. Centre is not only a nuclear command system it is also the main automated control system for the General Staff, for most branches of the Russian Armed Forces and for military districts.

Igor Mizin was a key member of Semenikhin’s large team of engineers. Mizin designed the Basic Data Exchange System (BSOD) which is at the heart of Centre.<sup>51</sup> BSOD is a system for reliably transferring packets of information (kodogram) between several locations. The creation of BSOD took place in parallel with the Pentagon’s development of ARPANET, the forerunner of the internet. BSOD was an equivalent but unique Russian military system.

<sup>50</sup> командная система боевого управления (КСБУ); The creator of the nuclear button, biography of VS Semenikhina by S Chudinov, M Loginov, H Ohanian and A Zatsarinny; [http://www.redstar.ru/2010/12/01\\_12/4\\_04.html](http://www.redstar.ru/2010/12/01_12/4_04.html)

<sup>51</sup> базовой система обмена данными (БСОД); Igor Alexandrovich Mizin – Scientist, designer, person, Edited by Academician IA Sokolova. [www.computer-museum.ru/books/archiv/Mizin\\_book.pdf](http://www.computer-museum.ru/books/archiv/Mizin_book.pdf)

Centre and BSOD were first tested in Central Command Posts in 1978-79. The system became fully operational in 1985 and has remained in continual use since then.

In the late 1980s the Automation Research Institute began work on a successor to Centre, but within a few years this effort slowed down. The end of the Cold War and the death of Semenikhin led to a sharp decline in work on automated command systems. The workforce at the Institute dropped from 12,000 to 1,500.<sup>52</sup> Little progress was made until 2002 when research efforts were revived. In 2006 the main focus of the Institute was providing support for BSOD. This accounted for 70 % of their work.

The alphanumeric designation for Centre is 65c1. The BSOD subsystem is 65c30. Other subsystems include 65c11, 65c32 and 83т11. All of these have recently been modernised.<sup>53</sup>

BSOD (65c30) has five main exchanges and seven regional exchanges.<sup>54</sup> Each subscriber in the system is connected by two or three communication channels with two or three of the nearest exchanges.<sup>55</sup> There are main exchanges in Gorki-25, (Naval Command Post), Monino (Air Force Command Post) and Moscow (Unit 25801). Two are in Chekhov region. Unit 10926, which is based in Chekhov-3, is responsible for both. One of them, Main Exchange 1, is the key element in BSOD.

The exchanges were all upgraded between 2008 and 2010.<sup>56</sup> The modernisation of BSOD involved introducing new components at each of the sites.<sup>57</sup> The first stage was to install 83т601 in Main Exchange 1 (Chekhov). 83т601 is the control point of the upgraded BSOD system and has the codename "fort". New elements were then added at each of the other sites in turn, and tested against 83т601. The other Chekhov station, Main Exchange 5, also played an important role in the upgrade procedure.

An important issue is how the overall command system, Centre, relates to the unique Rocket Forces' system, Signal. One identifiable interface between the two is 83т362. This links 15Э1, Signal, with 83т11, a subsystem of Centre. The 83т362 interface rapidly reformats data between the different formats used in Centre and Signal, taking account of the priority of specific messages. This interface was upgraded between 2008 and 2010.<sup>58</sup> A description of the upgrade says that the interface must be able to handle "links A".<sup>59</sup> This could be a reference to Signal A, the primary Rocket Forces' automated command system.

83т11 and 83т362 are both at three sites.<sup>60</sup> The first is in Moscow, the second is in Chekhov region, probably Chekhov-3, and the third is in Penza region, probably Kuznetsk-8.

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<sup>52</sup> Interview with the Director of the Academician VS Semenikhina Research Institute (НИИ АА), 2006.

<http://www.electronics.ru/issue/2006/7/1>

<sup>53</sup> The installation of 83т099 in 83т601 is described as "модернизация автоматических центров коммутации сообщений базовой системы обмена данными АСУ ВС «Центр»" <http://doc.gostorgi.ru/7/2009-06-10/401813/1.rtf/>

<sup>54</sup> ГЦКС - главных центров коммутации сообщений – main communications switching centre; ТЦКС - территориальных центров коммутации сообщений – regional communications switching centre.

<sup>55</sup> Igor Alexandrovich Mizin – Scientist, designer, person, Edited by Academician IA Sokolova. [www.computer-museum.ru/books/archiv/Mizin\\_book.pdf](http://www.computer-museum.ru/books/archiv/Mizin_book.pdf)

<sup>56</sup> <http://doc.gostorgi.ru/7/2009-06-10/401813/>

<sup>57</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=401813>

<sup>58</sup> <http://doc.gostorgi.ru/7/2008-12-29/243523/6.doc>

<sup>59</sup> "звеньев 'А'" could mean "level", "elements" or "means of communication". The detailed descriptions of 65c362 avoid using the word Signal.

<http://doc.gostorgi.ru/7/2008-12-29/243523/6.doc>

<sup>60</sup> <http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=700926>

<http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=766167>

Other components of Centre are automated command systems 65c11 and 65c32. These are present at three General Staff Command Posts, the Navy Alternate Headquarters (Gorki 25) and the Headquarters of the Northern Fleet (Severomorsk).<sup>61</sup>

The table below shows the location of key components of Centre.<sup>62</sup>

Location	Military Unit	BSOD (65c30) Exchange	BSOD (65c30) Upgrade	83Т11 & "Signal" Interface	65c11	65c32
Chekhov (Сектор)	10926	Main 1	83Т601 (fort) 83Т605	83Т11 83Т362		65c074
Chekhov	10926	Main 5	83Т614			
Kuznetsk 8	34011	Regional 6	83Т606	83Т11 83Т362	65c312 65c344-1	83Т132
Moscow	25801	Main 4	83Т602	83Т11 83Т362	65c855	65c074
Gorki 25 (Navy)	69039	Main 3	83Т611			65c074
Monino (Air Force)	29112	Main 2	83Т607			
Severomorsk (Navy)	15138	Regional 1	83Т609			65c074
Kaliningrad (Navy)	95154	Regional 2	83Т610			
Smolensk (Air Force)	83069	Regional 3	83Т603			
Novosibirsk (Air Force)	40283	Regional 7	83Т612			
Irkutsk (Air Force)	36728	Regional 8	83Т613			
Vladivostock (Navy)	20937	Regional 9	83Т608			

In two cases the Centre exchanges are close to the headquarters of missile divisions in the SRF. The Irkutsk exchange, in a settlement called Mountain near Khomutovo, is 8 kilometres from the headquarters of the 51<sup>st</sup> Guard Missile Division. The Novosibirsk exchange at Plotnikovo is 35 kilometres from the 39<sup>th</sup> Guards Missile Division. So, although Centre may not be regarded as a primary command system for the SRF, it is hard to image that in these cases it would not be used.

### Summit

The highest level of Centre is Summit (Вершина). This is an automated command system at the top of the Russian military structure. This is being upgraded to Summit-2. In 2008 a contract was awarded for training in the installation of Summit-2 at Object 320 in Moscow. Summit is probably installed at other General Staff command posts. The relationship between Summit and 65c27, the control system for Kavkaz-7, is unclear.

### Sea

In the 1980s the Navy developed their own automated command system, Sea.<sup>63</sup> This was designed to work with Centre. Like Centre, Sea is a command system for both nuclear and conventional forces. One of the design team's main objectives was to develop planning software for nuclear armed submarines.<sup>64</sup>

<sup>61</sup>Annual maintenance of 65c11 and 65c32 for 2010:

<http://www.zakupkiold.gov.ru/Tender/ViewPurchase.aspx?PurchaseId=700926>

<sup>62</sup> <http://www.zakupkiold.gov.ru/tender/ViewPurchase.aspx?PurchaseId=703800&TS=1>

<sup>63</sup> Море

<sup>64</sup> [http://flot.com/science/sf1.htm?sphrase\\_id=222940](http://flot.com/science/sf1.htm?sphrase_id=222940)

The Navy has recently developed a new information system, Karat, as part of Sea. In 2010 the following numbers of workstations for Karat were installed at nuclear submarine bases in the Northern Fleet: Severomorsk (headquarters) – 50; Polyarny – 10; Zaozersk -6, Skalisti – 5.

### Wing

The automated command system for the Long Range Airforce is Wing.<sup>65</sup> This operates in conjunction with “Centre”. Central Command Posts can issue orders through Wing to nuclear bombers.

### Perimeter

The feature of the SRF command system that has attracted most attention is Perimeter. This is a back-up to Signal and its subsystem Blizzard. It would be an exaggeration to describe Perimeter as a Dead Hand system or a Doomsday Machine, but it does provide a semi-automated way of launching Russia’s nuclear arsenal.

Signal sends messages down a hierarchy of command posts. Blizzard can transmit directly to ~~missile launch~~ centres using HF, VHF and satellite systems. Both use networks of communications facilities which are complex, yet still vulnerable. In contrast, Perimeter is based on a hardened command bunker with an underground Low Frequency antenna. The radio transmitter in the bunker has a limited range. It cannot directly reach most nuclear missile silos, but its coded message can be picked up by command missiles which are nearer. When the command missiles receive their instructions they are automatically launched across Russia. As they fly across the country these rockets broadcast a code to the entire SRF force. Computers in each nuclear missile complex interpret this code as an instruction to launch immediately.

The Perimeter command post is called the “Radio Command and Control Centre”. It is in the general vicinity of the main Central Command Post, possibly South of Moscow.

Perimeter was developed in the late 1970s and entered service in 1985. The SRF replaced the nuclear warheads on some SS-17 (15A16) missiles to create the first command missiles. Later they developed command versions of the mobile variant of SS-25. SS-17 missiles have been withdrawn from service. The 54<sup>th</sup> Missile Division at Teykovo, North of Moscow, is the only unit today with operational mobile SS-25 missiles.

Perimeter was designed as a fall-back system which comes to life after nuclear explosions take place in Russia. The SFR officers in the Perimeter bunker check for three conditions:

1. The Perimeter system has been activated (normally it is not).
2. All contact with command centres has been lost.
3. Seismic and visual sensors have automatically detected that Russia is under nuclear attack.

If all these conditions are met they transmit the message to launch the command rockets, which in turn launch all other missiles. There is a gap of 30-40 minutes between when the instruction is issued from the command post and when all missiles are launched, because of the flight time of the command rockets. If they were under attack from US nuclear forces, most of the missiles would have been destroyed before they were launched, but those that survived could all be launched by Perimeter.

One recent contract suggest that this system is being maintained in some form. In January 2009 an order was placed for spare parts for “15Э1М, 15Э601”.<sup>66</sup> 15Э601 is the alphanumeric code for Perimeter. This

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<sup>65</sup> крыло

order listed 75 components, many of them computer logic boards and electronic modules. It included 3030 Перфоэкраны, punch cards. The order was amended, reducing the number of punch cards by 30 and changing three of the logic boards. In March 2009 this order was deleted.<sup>67</sup>

There was also a recent court case involving a St Petersburg company which is carrying out work on a number of missile communications systems, including 15Э601 (Perimeter).

Perimeter probably retains some operational capability, although it is not normally activated.

A history of the 43<sup>rd</sup> Missile Division refers to the formation of a command and control centre for Perimeter in 1990.<sup>68</sup> In the late 1980s the 43<sup>rd</sup> Division was based in the Ukraine and was equipped with SS-20 missiles. Following the INF Treaty the missiles were withdrawn from service. In 1990 the 15<sup>th</sup> Missile Regiment, part of this Division, was disbanded. In its place was created the 1353 Command and Control Centre (1353 ЦБУ). Lt Col Kolonyuk, who had led the 15<sup>th</sup> Regiment, took charge of the new unit. In this role he was responsible directly to the Chief of the SRF Central Command Post, Odintsovo-10. The online history says that 1353 ЦБУ was part of Perimeter.

### Strategic Missile Forces Command structure

#### 27<sup>th</sup> Guards Missile Army (Vladimir)

60th Missile Division (Tatishchevo) - 41 SS-19, 49 SS-27

28<sup>th</sup> Guards Missile Division (Kozelsk) - 29 SS-19

7<sup>th</sup> Guards Missile Division (Bologoye-4) - 18 SS-25

54<sup>th</sup> Guards Missile Division (Teykovo) – 18 mobile SS-27, 3 mobile RS-24

14<sup>th</sup> Missile Division (Yoshar-Ola) – 27 SS-25

#### 31<sup>st</sup> Missile Army (Orenburg)

13<sup>th</sup> Missile Division (Dombarovsky) – 30 SS-18

42<sup>nd</sup> Missile Division (Nizhniy-Tagil) – 27 SS-25

#### 33<sup>rd</sup> Guards Missile Army (Omsk)

62<sup>nd</sup> Missile Division (Uzhur) – 28 S-18

39<sup>th</sup> Guards Missile Division (Novosibirsk) – 36 SS-25

51<sup>st</sup> Guards Missile Division (Irkutsk) – 27 SS-25

35<sup>th</sup> Missile Division (Barnaul) – 36 SS-25

### Strategic Nuclear Air Force

#### 37<sup>th</sup> Air Army

22<sup>nd</sup> Guards Heavy Bomber Division (Engels)

- 121 Guards Regiment – 13 Tu-160

- 184<sup>th</sup> Regiment – 23 Tu-95MS

(6950 Guards Air Bas Engels – 18 Tu-95MS)

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<sup>66</sup> <http://doc.gostorgi.ru/7/2009-01-23/255576/14.doc>

<sup>67</sup> <http://zakupkiold.gov.ru/Tender/Register.aspx?PurchaseId=255576>

<sup>68</sup> History of the 43<sup>rd</sup> Missile Division <http://43rd.ru/istoriya-43-gv-rd>

326<sup>th</sup> Heavy Bomber Division (Ukrainka) – 40 Tu-95MS  
- 79<sup>th</sup> Regiment  
- 182<sup>nd</sup> Regiment  
(6952 Air Base Ukrainka – 36 Tu-95MS)

**Strategic Nuclear Naval Forces**

Northern Fleet (Severomorsk)  
Gadzhievo – 5 Project Delta IV  
+

Pacific Fleet  
16<sup>th</sup> Squadron (Vilychinsk) – 4 Delta III

Total: 14 Delta III built (being withdrawn), 7 Delta IV (6 being kept in service), 6 Typhoon, 1 Borey (trials).