

POST-SOVIET RUSSIA AND UKRAINE: WHO CAN PUSH THE BUTTON?

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On Christmas Day 1991 at 7:15 p.m., the red flag over the Kremlin was replaced by the white, blue, and red tri-color of the Russian Federation, after President Mikhail Gorbachev announced his resignation to the nation. With that act, the Soviet Union, the largest nuclear superpower in the world, ceased to exist. Now, more than two years later, the worst case predictions of 1991 have been avoided. No major accident involving the nuclear infrastructure has been reported. Tactical nuclear weapons were successfully and quickly withdrawn from all non-Russian republics. Proliferation of the Soviet nuclear stockpile beyond the borders of the Commonwealth of Independent States (CIS) has been prevented. However, not all challenges to the integrity of the Soviet nuclear command and control system have been neutralized. Russia has failed both to introduce its own control over all former Soviet nuclear capabilities and to repair former deficiencies in its inherited command and control system. While Belarus and, to a lesser extent, Kazakhstan, have shown a cooperative attitude towards withdrawals of nuclear weapons from their territories, Ukraine has established

partial control over the strategic arms located within its borders. In fact, during the last two years, the single Soviet command and control system disintegrated into two systems: the Russian one, which inherited both experience and deficiencies from the Soviet past; and an emerging Ukrainian system, whose current legal status is still not clearly defined. Interaction between the systems and their redundancy remain problems of significant concern. And the question of whether Russian and Ukrainian command and control systems would provide reliable protection against accidental or unauthorized use of nuclear weapons, remains unanswered.

COMMAND AND CONTROL OF RUSSIAN NUCLEAR WEAPONS

The former Soviet nuclear arsenal is still deployed in the territories of four states: Russia, Ukraine, Belarus, and Kazakhstan. However, only the Russian Federation proclaimed itself to be the Soviet Union's nuclear successor. In fact, Russia also inherited *de facto* control over former Soviet nuclear forces. None of the other former Soviet republics claimed full nuclear

status. By mid-1994, Belarus and Kazakhstan acceded to the Non-Proliferation Treaty (NPT) as non-nuclear weapon states. Ukraine pledged to join the NPT as soon as possible and to remove all nuclear weapons from its territory within seven years of the implementations of the strategic arms reductions mandated by START I. Therefore, both *de jure* and *de facto* Soviet nuclear weapons can now be considered to be essentially Russian.

Like the U.S. and former Soviet systems, the Russian command, control, communications, and intelligence system (C³I) consists of three components: 1) early warning, information gathering, and processing systems (reconnaissance satellites, radars, and radio electronic interception facilities); 2) command centers under political and military control (stationary underground centers, and air-, ground-, and sea-mobile centers); and 3) communications systems that link the first two components together, along with nuclear weapons operators, to guard and launch weapons. This command and control infrastructure allows Russian political and military leadership to control nuclear forces in peacetime, to initiate their transition into higher states of alert in a crisis, and, if

necessary, to use them in case of war.

C³I has two main functions. The first is to provide positive control of nuclear weapons in a war. To accomplish this, C³I transmits orders from the leadership to subordinate nuclear forces, making sure the orders are properly executed. The second function is to prevent the unauthorized or accidental launch of forces as a result of technical malfunctions, a renegade subordinate, or an attack by outside forces and terrorists. Simultaneously, the system keeps adequate combat forces on alert. In sum, C³I can be relied upon to undertake the launch of nuclear weapons in a war and to prevent their misuse either in peacetime or during a conflict. The former function is known as "positive" control, the latter as "negative" control. This article will address the system of negative control provided by Russian national command authorities (NCA) and by lower-ranking military officers.

National Command Authority

The system of command and control was always among the most heavily-guarded Soviet secrets. The first attempt by two Moscow academic analysts to publish an article on the problems related to C³I ("SUS," in Russian) was temporarily censored by the military. Permission to publish was refused on the grounds that the Soviet Union "did not possess" such a system. Only after the authors found a citation by a top military official from the 1970s using the term "SUS" was the article permitted to appear in the journal World Economy and International Relations (in Russian -MEiMO).¹

Like the Soviet system, Russian command and control is based on a "triple key" system. The first key belongs to the President of Russian Federation. It is not a physical button but a system of nuclear launching codes.² The codes are kept in a black case held by a military officer who constantly shadows the leader.³ In order to initiate a launch, the codes, (say, figures 153) must be sent by the President to the Defense Minister, who holds the second set of codes. Adding his share of codes (say, 153609), the minister transfers them to the Chief of the General Staff, the holder of the third key. After entering his codes (e.g. 153609731) the chief passes them to the launching crews. The transmission of codes is executed and controlled by the Main Operational Directorate ("GOU," in Russian) of the General Staff. The whole operation should take about 15 to 20 minutes to complete.

According to some sources, the codes from the Defense Minister and the Chief of the General Staff have to be sent separately in order to limit access by unauthorized personnel. Since the General Staff may possess a spare set of codes belonging to the President, the division of codes between two top military officials is crucial in preventing a conspiracy against the political leader.

As a continuation of the Soviet system, Russian C³I inherited all its deficiencies. One of them is the absence of any known mechanism for transferring power if the President is disabled. On October 3, 1993, President Yeltsin issued a decree, ordering Prime Minister Chernomyrdin to execute the presidential duties in case of Mr. Yeltsin becomes disabled. If Mr. Chernomyrdin were also disabled,

First Deputy Prime Minister Gaidar was named next to replace him. In fact, this decree marked the first time that a Russian leader has attempted to legalize the procedure of transferring power in a crisis. However, it is doubtful whether the procedure established by the decree is still valid. The decree reflected a political reality that existed for a very short period of time--during the coup d'etat attempted on October 3-4, 1993. Since that time, the political situation has changed dramatically. Mr. Gaidar had to resign, and a new Constitution has been adopted. The Constitution confirms that it is the Prime Minister who must replace a disabled President. But it contains no instructions on who would replace the Prime Minister.

The other deficiency is rooted in the fact that the former Soviet Union preferred to rely on administrative control, rather than technical measures. Thus, during the Cuban missile crisis, General Pliyev, Commander-in-Chief of Soviet forces in Cuba, had the technical ability to launch Soviet intermediate-range ballistic missiles (IRBMs) against targets on American soil. In the case of a direct U.S. invasion, Pliyev possessed the administrative power to launch the missiles without receiving the necessary orders from Moscow.⁴

The administrative preferences could be easily explained by the nature of the Soviet system of power. In fact, all three keys were kept in one pocket, that of the *nomenklatura*. It was internally consolidated by its ruling class self identification, common ideology, and discipline. Within the *nomenklatura*, control through administrative means was the most reliable.

Khrushchev had every reason to believe that General Pliev would do his best to defend the interests of Moscow's ruling class and fulfill the Kremlin's orders--either by launching or not launching missiles from Cuba--without any constitutional or technical guarantees to that effect.

Not surprisingly, the reliability of Soviet command and control eroded along with the demise of the *nomenklatura's* power. The first evidence of this was provided as early as August 1991. Then-President Gorbachev was easily deprived of his key, when all branches of the security establishment combined in their efforts to neutralize him. In their opinion, Gorbachev had moved too far in distancing himself from the traditional sources of political power.

The Status of the Nuclear Keys During the Two Attempted Coups

It is probable that during the last days of the coup, all three keys fell into the hands of then-Chief of General Staff Marshal Moiseev. As was mentioned above, President Gorbachev was deprived of his set of codes Sunday afternoon, August 18, 1991, and did not take them back until Thursday, August 22, 1991. It is likely that then-Minister of Defense Marshal Yazov lost his codes as early as Wednesday morning, August 21, when he was completely demoralized by the failure of the coup. Later the same day, he left Moscow for Crimea. Evidently, all the keys were transferred only to the General Staff, because other agencies were either paralyzed or did not possess the technical ability to carry the codes. Moreover, on Thursday, Marshal Moiseev was nominated as acting Minister of Defense. This

permitted him to hold two sets of codes a day longer--until Friday night, when he was replaced by General Shaposhnikov. Thus, during three days of one of the deepest domestic crises in Russian history, the only guarantee against concentration of all sets of codes in one pair of hands--the division of them between the Minister of Defense and Chief of General Staff--proved its inefficiency.

During the second coup attempt, in October 1993, the reliability of the "triple key" system was challenged once again. Sunday evening, October 3, 1993, buildings of the General Staff in the center of Moscow were blocked by rebel fighters, loyal to Vice President Rutskoi. The rebels circled the buildings, where the offices of both the Minister of Defense and Chief of General Staff were situated, and did not permit anyone to enter. Reportedly, at that time, support for the top military leaders was so weak that after several hours of uncertainty the headquarters of the most capable armed forces in Eurasia were cleared, not by regular troops or the guards of the staff, but by civilian veterans of the Afghan war, personally loyal to the Minister of Defense.

Thus, for several hours, two sets of keys--and maybe a spare set of the Presidential codes--could have been seized by para-military and ill-disciplined gangs. Moreover, some of their warlords, who were represented by former top army and KGB officers, might have known how the transmission of codes could be executed. They might also have enjoyed some tacit support from the General Staff officers. Due to fears of the latter's disloyalty to the regime, in late September 1993, telephones in their offices were discon-

nected in order to complicate communications between them and the Supreme Soviet. At that time, the warlords were not controlled by the Supreme Soviet leaders, whom they were nominally subordinated to. Thus, the uncontrollable guerilla-type commanders were very close to obtaining the keys for the Russian nuclear forces, along with the possible capability to install the control over the system of execution of the NCA's orders.

New challenges to the division of codes emerged after the October coup. Due to their role in the Presidential victory, the military consolidated its position in Russian domestic politics. Together with the weakening of the legislative branch of power, this led to the further degradation of civilian control over the military. Most certainly, it undermined the civilian role in nuclear decisionmaking as well.

In the former Soviet Union, an interagency competition between the Ministry of Defense and the General Staff represented one of the most important guarantees against the concentration of the codes in one person's hands. Due to lack of civilian control, this competition plays an even more important role in modern Russia. However, the balance of power between the agencies was changed. In the 1980s, aging and unpopular defense ministers contrasted with the "stronger" and more professional chiefs of the General Staff. The General Staff establishment gradually consolidated its position, and by the early 1990s, it had become a leading decisionmaker within the military. But since August 1991, the institutional role of the agency has been significantly reduced. Although recently the General Staff has regained its role in

nuclear decisionmaking, institutionally it remains in the shadow of the "strong" Minister of Defense. Thus, the General Staff's nuclear positions are balanced by its secondary role to the Ministry of Defense, which now determines general aspects of the military policy.

On the level of national command authorities, Russian command and control inherited the Soviet system with all its deficiencies. Paradoxically, the failure of the totalitarian Soviet system added new challenges to the country's C³I. The military consolidated its position in nuclear decisionmaking to an extent that it had never enjoyed in the former Soviet Union. Great domestic instability led to a situation, where the NCA could be destroyed in the course of a new coup d'état, and some or all the keys might be seized by irrational and militant hard-liners.

The Unsuccessful Post-1991 Reforms in Command and Control

After the August 1991 coup, some measures were implemented in order to improve negative control over the nuclear forces. On October 6, 1991, then-President Gorbachev announced the establishment of the Strategic Deterrent Forces ("SSS," in Russian). This new armed service would put all the strategic nuclear weapons under unified control. Previously, they were subordinated to three armed services: land-based ballistic missiles were commanded by Strategic Rocket Forces ("RVSN," in Russian), strategic submarines by the Navy, heavy bombers, as well as medium range nuclear-capable bombers by Dal'aviatsia High Command, which was subordinated to the Air Forces.

The SSS was created to replace the RVSN, and General Maximov, previously chief of the Strategic Rocket Forces, was appointed as a commander-in-chief of the new service. During the coup, General Maximov demonstrably decreased the state of alert of Soviet land-based ballistic missiles, withdrawing ground-mobile RS-12M missiles from routine patrol to their hangars. Thus, he provided clear evidence to Washington that first, the command and control structure of the RVSN was not affected by political developments, and second, that the Soviet military tried to prevent penetration of domestic instability into superpower nuclear relations.

The third key, belonging to the Chief of the General Staff was shared between him (General Lobov, from August to November 1991) and General Maximov. After the resignation of General Lobov, the third set of codes was not given to the new Chief of the General Staff General Samsonov, but was concentrated in the hands of the SSS commander-in-chief. Some Russian sources⁵ suggest that the third key was distributed among commanders-in-chief of all four armed services: the Ground Forces, the Navy, the Air Forces, and the SSS. However, the fact that the Ground Forces, which did not control any strategic nuclear delivery vehicles, were mentioned, challenges the truth of these claims. It is more likely, that the chiefs of the armed services, except the SSS, either received "local" codes, previously possessed by commanders of lower ranks, or were granted more freedom of action. Some technical capabilities may also have been provided, permitting them to stop transmission of commands down the hi-

erarchy if they doubted the appropriateness of NCA orders.

Undoubtedly, the transfer of the third key to the SSS Commander-in-Chief, as well as the more important role of the chiefs of the other armed services, undermined the monopoly of the General Staff over possession of the codes and execution of their release and transmission. Nevertheless, it is not clear whether the redistribution actually strengthened negative control. The Chief of the General Staff enjoyed relative independence from the Minister of Defense. There was also the traditional competition between the Ministry of Defense apparatus and that of the General Staff. This made it easier for the Chief and the staff itself to refuse, if necessary, to release its share of codes for further transmission. On the other hand, the SSS Commander-in-Chief is subordinate to the Minister, and his possible refusal would be in conflict with the essence of military discipline, and thus might seem less probable than a similar refusal by the Chief of the General Staff.

However, the reforms in the sphere of command and control that were implemented in the fall of 1991 can be evaluated as the first serious attempt made in 25 years to improve the degrading C³I structure. The real innovations became possible only after the old totalitarian structure ceased to exist in August 1991. But, the events that followed it, and, most importantly, the disintegration of the Soviet Union, halted the process at a very early stage.

Command and Control in Transition: From the Soviet Union to Russia

The disintegration of the Soviet

Union put the future of all the keys in question. The problem was settled, at least temporarily, during two summits attended by leaders of 11 former republics, one in Alma-Ata, Kazakhstan, on December 21, 1991, and the other in Minsk, Belarus, on December 30, 1991. Some questions were clarified in further meetings.

In the Declaration of Alma-Ata, the leaders of 11 republics founded the Commonwealth of Independent States and agreed "to maintain a united command of military-strategic forces and single control of nuclear arms."⁶ On the same day, leaders of the four "nuclear" republics--Russia, Ukraine, Kazakhstan, and Belarus--signed the "Agreement on Common Measures Towards Nuclear Weapons." Article IV states that "before complete elimination of nuclear weapons on the territories of the Republic of Belarus and Ukraine, decisions on the necessity of their use will be made, after approval by the heads of states of the Parties, by the President of the RSFSR."⁷ At the next summit in Minsk, the duty of the Russian President was formulated in a slightly different manner: the decision to use nuclear weapons would be made by Moscow in consultation with the leaders of the seven non-nuclear republics and after approval by the three "nuclear" presidents in Kiev, Minsk, and Alma-Ata.

The command and control system established within the CIS framework, can be considered to be satisfactory only as a provisional system, operational for a short period of time. The following events proved that the compromise was ineffective and even dangerous.

On December 25, 1991, the "button" was transferred from President

Gorbachev to President Yeltsin. Unlike the chiefs of the armed services, Mr. Yeltsin obtained the whole set of codes. The leaders of Ukraine, Kazakhstan, and Belarus did not possess any codes that might have permitted them to launch nuclear delivery vehicles. Instead, a special communications network was installed in the presidential offices in the three capitals, linking them with Mr. Yeltsin's office in Moscow. In theory, before making a decision about launching nuclear forces, the Russian President was to call the three capitals and ask the leaders for their approval. In theory, the President would send his codes to the military only after receiving this approval.

While clear on paper, the new procedure was more of a political compromise than a practical solution. In reality, it was questionable whether the Russian President, faced with the threat of incoming missiles, would have an extra five to seven minutes to call the three republic leaders, especially since, Belarus and Kazakhstan, at least, do not have any power to block whatever decision Moscow might make. Even if the newly-independent states refused to grant him their approval, the President might still have a strong incentive to ignore their prohibition. It is also conceivable that the republics would say "no" to Moscow simply as a way to demonstrate their independence or to avoid any responsibility for such a fatal decision.

The Russian technical ability to launch strategic nuclear weapons from territories of the other states without permission from their authorities was evaluated as unacceptable by Ukraine and provided an incentive for it to initiate its own command and control activity. Kiev used

the inefficiency of Russian negative control over strategic weapons deployed in Ukrainian territory as a smoke screen to camouflage its attempts to gain positive control. Data on continuous research and development activity in some Ukrainian enterprises directed at creation of the state's own codes were often explained by Kiev's officials as aimed at preventing an unauthorized launch of the weapons from its national territory.

It should be mentioned, however, that the position of the High Command of the CIS Joint Armed Forces (JAF) provided an important argument for proponents of establishing a separate Ukrainian system of negative control. The High Command consistently opposed any national attempts to participate in nuclear decisionmaking. On those grounds, Air Marshal Shaposhnikov refused to grant the Ukrainians the technical means necessary for preventing a launch of nuclear weapons, unauthorized by Kiev, from Ukrainian territory. He repeatedly stated that a "hot line," which was established between Kiev and Moscow, in accordance with the Alma-Ata and Minsk agreements, was "quite enough" for preventing the launch.⁸

At the same time, the CIS umbrella was becoming less and less appropriate for Russia itself. Since early 1992, units of the former Soviet Armed Forces in Ukraine, and later in Belarus, were put under the control of the republics' governments. In fact, the CIS JAF appeared to be no more than the Russian Armed Forces (RAF). Naturally, the Kremlin could no longer agree with the procedure, whereby commanders-in-chief of the forces (almost completely financed from the Russian budget) were nominated by all

the CIS leaders. By April 1992, Moscow simply had no other option but to formally establish the Russian Ministry of Defense.

On the other hand, until the summer of 1993, Russia was unable either to abrogate the high command of the CIS JAF or to openly transfer the nuclear command and control system to the RAF without risking violation of the Commonwealth agreements. This led to a highly undesirable situation wherein the single command and control structure was commanded by two headquarters--Russian and CIS.

This dual command significantly complicated legal aspects of command and control. Holders of two sets of codes, the commanders-in-chief of the CIS JAF and the CIS Strategic Deterrent Forces, as Russian citizens, felt obligated to fulfill the orders of the Russian President. But previously they were not obliged to subordinate to him as to the Supreme Commander-in-Chief: under Commonwealth regulations, their superior body was the Council of the CIS Heads of State. However, this Council, according to the same regulations, was not a permanent body; it met irregularly and lacked any rights in the field of nuclear command and control.

All this created a potentially dangerous lack of political control over nuclear decisionmaking. Moreover, theoretically, the risk of conspiracy between top CIS generals had been increased. Both morally and institutionally, they were on the same side of the barricade of interagency competition. Establishment of the RAF made them generals without an army. They were also naturally interested in decreasing the role of Russian military institutions that were constitutionally subordinated

to the Russian President, their Supreme Commander-in-Chief.

Certainly, the personal loyalty to the Kremlin of Marshal Shaposhnikov and General Maximov could not be questioned; however, resumption of the old Soviet-style inclination to rely on personal relations rather than on legally defined procedures created a regrettable precedent for the future, when links between new leaders might wear thin.

The situation was further complicated by a growing difference between the formal CIS JAF structure and the emerging composition of the RAF. The new Russian military command chose to abandon the last-ditch Gorbachev innovations made in the fall of 1991, and to return to the traditional structures that existed in the Soviet Armed Forces. Under this approach, not only was the Air Defense (PVO) re-established as a separate armed service, but there was once again a fixed separation of strategic nuclear delivery vehicles between three armed services: the Navy, Air Forces, and the revitalized RVSN. This approach probably led to relevant modifications in nuclear command and control.

The discrepancy was once again fixed not by legal modifications, but by the tacit transfer of keys from the CIS to Russian command. Since the very beginning, the new Russian RVSN High Command occupied the same headquarters as the CIS Strategic Deterrent Forces and was operated by practically the same personnel. Thus, one may assume that from the start they not only inherited the SSS network designated to execute NCA orders, but obtained at least one spare set of codes belonging to the SSS Chief. The whole distribution of the third set of keys-

-once possessed by Soviet Chiefs of General Staff, and later by the SSS Commander-in-Chief--might also be changed. A diminishing role for the Strategic Rocket Forces vis-a-vis other armed services (evidenced, in particular, by the relatively quick agreement of the Russian Defense Ministry to START II Treaty conditions under which the RVSN would be deprived of its traditional role as a cornerstone of the Russian strategic deterrent) could lead to a tacit transfer of the third key back to the General Staff.

The fate of the second key was solved in the same way. After establishment of the Russian Defense Ministry, Air Marshal Shaposhnikov had to change his office from the General Staff building in Vozdvizhenka to the former Warsaw Treaty Organization (WTO) headquarters on Leningradsky Prospect. Some analysts suggest that the WTO building is ill-equipped to provide reliable communications for the holder of the second key. Therefore, they think the key was left in the old office and, most probably, was inherited in early 1992 by its new occupant, Russian Defense Minister Grachev.

The Kremlin's plan to keep the CIS command structure for a year after establishing the RAF, despite the fact it challenged some of Russia's own interests, could be explained as a response to an extremely controversial Ukrainian position. For Kiev, the CIS command over strategic nuclear forces deployed there seemed much more appropriate than direct Russian control. At least on paper, a procedure established in December 1991 provided the Ukrainian President with a veto in nuclear decisionmaking and, thus, met Ukrainian demands for a higher

nuclear status. However, Ukraine did not want to pay even a symbolic political price for that. Kiev refused to join the CIS JAF. Moreover, the Kravchuk administration did not sign the CIS Charter and, thus, became unable to claim full membership in the Commonwealth. Therefore, until summer 1993, the strategic nuclear weapons on Ukrainian soil appeared to be under the legal control of the Armed Forces and multilateral organization, in which Ukraine did not fully participate.

The incorporation of the 43rd RVSN and the 46th air armies into the Ukrainian Armed Forces, ordered by President Kravchuk on April 5, 1993, marked a failure of all efforts to maintain the CIS command over the strategic forces in order not to provoke Ukraine into withdrawing from its obligations under the Alma-Ata and Minsk agreements. Moscow had to make a decision on abrogating the post of the Commander-in-Chief of the CIS JAF. This decision finally solved the controversies between the CIS and Russian structures. Since that time, the Russian Defense Minister and Chief of the General Staff have been the legal possessors of the second and third keys.

Simultaneously, the formal cancellation of the CIS JAF meant the end of an integrated command and control system over the former Soviet strategic nuclear arsenals. Kiev made another important step towards establishing its own control over the weapons located on Ukrainian territory. While the Russian role was reduced to providing technical assistance for routine maintenance of what have become Ukraine's nuclear weapons.

After the disintegration of the So-

viet Union in December 1991, the constitutional and legal bases for political control of nuclear issues became even weaker than they were after 1989. The adventures of the keys on their way from the Soviet Union to the CIS and then to Russia led to two consequences. First, the main problem arises from the difficult political relations between former Soviet republics, especially between Russia and Ukraine. Ukrainian claims to the strategic nuclear weapons remaining on its territory did not permit Russia to put all the former Soviet Strategic Forces openly under Moscow's jurisdiction. This leaves open the question: how many states will share the Soviet nuclear legacy? Second, the tough Ukrainian position postponed Russia's establishment of legal control over non-Ukrainian weapons, including those located on Russian soil. This postponement prevented Russia from using the favorable domestic political situation in Russia during 1992-93 to improve the legal status of the military vis-a-vis the civilian leadership. The increasing role of the military, resulting from the October 1993 events in Moscow, limits the chances of solving the problem in the near future.

Nevertheless, Russia's establishment of clear jurisdiction over the bulk of the former Soviet nuclear forces by the summer of 1993 can be described as a significant achievement. Russia successfully limited the number of successor states claiming nuclear status. This served as a necessary precondition for the initiation of debates within Russia on the legal definition of rights and responsibilities in the nuclear C³I. Such a definition is very important for establishing a reliable foundation for Russian nuclear decisionmaking.

Negative Control on Nuclear Bases

Russia

The procedures and methods of negative control on nuclear bases and storage sites differ significantly, depending on the type of weapons and their age. According to some accounts, the most reliable negative control exists on intercontinental ballistic missiles (ICBMs). Their nuclear warheads are usually mounted on deployed missiles, where they remain in a constant state of alert, ready to be launched in a retaliatory strike.

As they did in the former Soviet Union, the missiles fall under the jurisdiction of the RVSN. Their launch requires three sets of codes—from the President of the Russian Federation, the Russian Defense Minister and the Chief of the General Staff. The orders from NCA are relayed through several communications channels controlled by the GOU and, possibly, the Federal Agency of Governmental Communications and Information ("FAPSI," in Russian). After receiving the launch codes, two officers must act simultaneously in order to activate the launching and targeting systems. Perhaps, the RVSN headquarters are technically able to abort the transmission of codes. The Navy may also possess the same ability to halt the sending of codes from the NCA to strategic submarines.

At this time, all organizational and guarding methods are not known. However, they are considered to be the most effective among all other legs of the strategic triad. The same is true of technical blocking devices, which prevent unauthorized access to launch and targeting systems with-

out the appropriate codes from the NCA. In some cases, unauthorized attempts to access this system automatically disable the missile. ICBMs are equipped with several layers of protection, including coded switches which can only be activated by entering codes from external sources.⁹

Russian RVSN legally provide operational control over ICBMs located in Russian territory, as well as in Belarus. Despite the absence of agreements that clearly define the legal status of land-based missiles deployed in Kazakhstan and Ukraine, initially both republics also had to accept such control. In an interview with a Russian governmental newspaper, President Kravchuk, without any hesitation, mentioned the fact that in late 1992, RVSN provided operational control over the ballistic missiles located in Ukraine.¹⁰

Later developments brought some alterations in RVSN control over the missiles deployed in Kazakhstan and, especially, in Ukraine. In March 1994, Russia assured the Kazakhstan's President that the ICBMs would not be launched without permission from Almaty. However, it is doubtful that the assurances will be translated into implementation of real technical measures that would enable Kazakhstan's authorities to fulfill effective negative control. In the case of Ukraine, since 1992 the RVSN cannot be confident that its orders would be fulfilled by the personnel. In fact, Ukraine was successful enough in establishing its own C³I system, although it is embryonic and incomplete. The Ukrainian system will be discussed in more detail below.

The control of patrolling submarine launched ballistic missiles

(SLBMs) is very complicated because submarines need to keep their antennas above water in order to communicate with coastal bases, thus increasing the risk of being detected by an opponent's anti-submarine sensors. The same reason explains the one-sided communications from the coast with strategic submarines. In addition, signals from the base are broadcast at a low frequency, permitting only a limited volume of information to be relayed over a certain period of time. Thus, the NCA cannot be sure that in a crisis they would be able to transmit their codes to submarines—the routine time to communicate may not coincide with the time the codes need to be transmitted.

There is some evidence that this led to a situation in the U.S. where all codes necessary to launch SLBMs were distributed among the officers of submarine crews. It is difficult to say what type of data is broadcast from the coast in order to signal for a launch. It is believed that officers would launch SLBMs if the routine signals from coastal low frequency (LF) stations were interrupted.

However, in order to launch missiles from patrolling Soviet subs, codes from the coast are supposedly necessary. Submarine crews can activate SLBMs only after receiving NCA codes that can be relayed by extremely low frequency (ELF) communications stations even after a first strike. Because all SLBMs are deployed at bases in Russia, the non-Russian states have no ability to establish control over SLBMs.

Reportedly, in the 1980s, the Soviet military established command and control measures that would guarantee launch of strategic nuclear weapons even if all top civilian and

military leaders had been killed in a surprise, decapitating nuclear attack. These measures represented its response to the deployment of the U.S. Pershing-2 intermediate range ballistic missiles in Western Europe. The very short flight time of the missiles could deny the Soviet leaders enough time to release and transmit the codes necessary to retaliate. This "doomsday machine" became operational after the perceived main source of the decapitating strike was removed as a result of the Intermediate-Range Nuclear Forces (INF) Treaty.

According to some American data, which were indirectly confirmed by a knowledgeable Russian expert,¹¹ spare sets of codes are routinely kept in one or more command posts. In the case of a nuclear attack and an end to communications with the NCA, personnel in the command post(s) are authorized to release codes to the missiles bases and submarines without receiving any orders from the national leadership. There is no reliable information on whether the codes are kept in the command posts in peacetime, or whether they are delivered there only during a major crisis. It is also not known what kind of procedure could prevent an unauthorized release of the codes by such personnel. One can only assume that the codes are stored in a heavily guarded facility. The custodial troops would allow launch personnel to enter the facility only under certain and well-defined circumstances. Among the personnel, access to the codes and their further release might be provided by two or more authorized launch officers.

As mentioned above, the Gorbachev initiative of October 1991 stated that nuclear gravity

bombs and air-launched cruise missiles (ALCMs) should be removed from heavy bombers and stored separately in army storage sites. It is unclear whether the initiative led to the actual withdrawal of nuclear warheads from all bases with strategic aircraft.¹² However, nuclear ammunition for heavy bombers is now stored in the same way as warheads designed for non-strategic forces. The same type of storage will take place for warheads from the Ukrainian ICBMs, recently removed under provisions of the Trilateral Statement. Unlike strategic weapons, nuclear warheads for non-strategic arms (with two exceptions: warheads for nuclear ABM interceptors and warheads for naval torpedoes and SLCMs) are stored separately from their launchers in heavily guarded storage sites.

Until the early 1960s, storage sites were guarded by troops under KGB command. After that time, they were re-subordinated directly to the Ministry of Defense, which, after the disintegration of the Soviet Union, was reorganized into Glavkomat--the Supreme High Command of the CIS JAF. Within Glavkomat a separate Directorate, with the code number v/ch 31,600, was responsible for storing and relocating nuclear warheads.¹³ After disbanding the Glavkomat in the summer of 1993, the Directorate was re-subordinated to the Russian Ministry of Defense. The Directorate asks custodial troops to transfer warheads to the armed services to be mounted on delivery vehicles only after receiving codes from the NCA.

The custodial troops are not responsible for activating the weapons. The distinction between guarding and launching forces provides an important guarantee against their

unauthorized use. But the question remains whether the guarding troops possess the technical ability to gain access to the warheads.

American sources have pointed out that the majority of weapons are equipped with mechanical, electro-mechanical, and electronic blocking devices to prevent unauthorized access.¹⁴ These devices can be unblocked only after receiving the necessary codes from Moscow. The newest devices contain electronic and electro-mechanical "permissive action links" (PALs) which have "lock out" features that not only deny further access, but can also disable the weapon if the wrong codes are continually entered. Nuclear warheads may also be designed with "tamper-proof" devices that automatically disable the warhead, in some cases by exploding a portion of the conventional triggering device if somebody tries to forcibly break into the weapon. Other types of devices allow the custodial troops to rapidly disable warheads if they are under attack.

However, the traditional Soviet lack of attention to negative control over the tactical nuclear weapons raises some doubts about whether the blocking devices are actually as efficient as they are intended to be. Negative control over tactical nuclear warheads is reported to be less reliable than that over strategic warheads/weapons. The Soviet military tended to think about strategic weapons as arms that would never actually be used. On the other hand, tactical nuclear weapons were often considered a valuable operational tool, which could, for example, be used to interrupt an enemy's defense fortifications. This warfighting nature of non-strategic nuclear weapons affected the reliability of nega-

tive control. In the past, codes for activating tactical and even theater nuclear warheads were in the possession of the commanders-in-chiefs of military districts. They were kept in a closed envelope, which could only be opened after receiving verbal orders from Moscow.¹⁵ Thus, the different subordination of custodial and launching troops was the only guarantee against a renegade chief of a military district acting on his own.

In 1991, the codes were purportedly transferred to commanders-in-chief of the armed services. If so, a situation in which the codes could have fallen into the hands of the former republics was eliminated. But in February of 1992, President Kravchuk removed the commanders-in-chief of all three military districts situated on Ukrainian territory who demonstrated their loyalty to Moscow. They were replaced by generals loyal to Kiev. Under traditional code procedure, the contents of the envelopes might also have been passed to Ukraine.¹⁶

Another serious threat is the fact that old tactical nuclear warheads are equipped with unreliable mechanical blocking devices, or are not equipped with any devices at all.¹⁷ Custodial troops would probably be able to overcome the primitive PALs and to directly activate those tactical nuclear weapons without blocks. Of course, such warheads are not useful without their delivery vehicles. But, given the fact that Ukraine has asserted its "jurisdiction" or even direct control over nuclear-capable tactical weapons systems, and considering that the borders of the former Soviet Union are becoming less and less protected, the storing of such warheads is a matter of great concern.

According to at least some data, a significant number of nuclear warheads are not equipped with blocking devices at all. The new electronic or old mechanical devices are installed only on entrances into the storage facilities. Thus, unauthorized access to the warheads becomes easier.

Ukraine

In 1992-93, Ukraine made several significant steps towards establishing its own command and control structure over strategic weapons located there. In 1993, the Center of Administrative Control over Strategic Nuclear Forces ("TsAU SYaS," in Ukrainian) was established in the Ukrainian Ministry of Defense. As was mentioned above, in April 1993, President Kravchuk incorporated the troops operating strategic arms into the Ukrainian Armed Forces.

In December 1992, Leonid Kravchuk officially confirmed, that "today I have an opportunity to block unauthorized use of nuclear weapons from the territory of our state."¹⁸ His further statements could be interpreted to mean that Kiev had established its own rudimentary command and control system, permitting him to install an effective negative control over strategic weapons located in Ukraine.

The scheme of the Ukrainian negative control is the following. If the Russian President failed to obtain Ukraine's permission to launch the missiles, or forgot to ask for it, the Ukrainian President could order TsAU SYaS not to fulfill instructions coming from Moscow. Through its communications links, TsAU SYaS would ask custodial troops of the 46th Air Army not to

withdraw nuclear warheads and ALCMs from their storage sites. Pilots of strategic bombers would be instructed not to leave their air fields.

Through a direct communication link, which since 1992 has connected Kiev to a command post of the 43rd RVSN Army located near Vinnitsa, TsAU SYaS could order the headquarters to stop retransmitting codes from the Russian NCA to missile bases. As early as 1992, Kravchuk also mentioned "special signals," permitting him to block the launch of missiles that he had not authorized. However, it is still unclear whether Ukraine would rely on the discipline of Vinnitsa officers and their ability to intercept transmission of codes if Moscow's orders did not receive approval from Kiev. The reference to "special signals" might also mean that Kiev has installed additional "yellow-and-blue" blocking devices, which could be overcome only after receiving de-blocking codes from Ukrainian authorities. However, even if Moscow's orders were re-transmitted by the Vinnitsa command post, the personnel at the missile bases might refuse to follow them because in 1993 they were also "administratively" re-subordinated to Ukraine.

Ukrainian officials always underline that they provide purely administrative control over the strategic weapons, while the Russians provide "operational" control. According to them, "administrative" control just means fulfilling the day-to-day needs of the personnel. The troops' re-subordination to Kiev is explained by political reasons: stationing of non-Ukrainian troops in Ukraine is perceived there as undermining its independence.

However, in practice the "admin-

istrative" control means something more than simply delivering food and money for the personnel, who, nevertheless, continue to follow orders from Russia (except those directed at launching the missiles). First, the "administrative" control effectively denies Russia an opportunity to launch the missiles from Ukrainian territory. The Kremlin will hardly release its de-blocking codes to unreliable personnel, who could disclose them to their commanders in Kiev. From this viewpoint, Ukrainian negative control over the missiles stationed there might be considered absolute.

Second, and more important, since late 1993 Russia's capability to deny the Ukrainians positive control was drastically reduced. Moscow still possesses targeting programs for ICBMs and ALCMs; it also controls codes permitting missiles to be launched, as well as activating all or a part of nuclear warheads designated either for ICBMs or ALCMs. Even if all the warheads were actually equipped with blocking devices (the devices could be installed only on entrances to storage facilities), the technical features themselves could not be considered a sufficient guarantee against Ukraine gaining unauthorized access to weapons. The weapons are guarded by and are routinely accessible to the Ukrainian troops.

Since 1992, custodial protection of warheads designated for heavy bombers, as well as those removed from strategic missiles, is performed by troops under Ukrainian control. In early 1993, Russian experts were even denied access to the storage sites. They were permitted access again only when a risk of radioactive leakage from the warheads emerged because of improper stor-

age. The Trilateral Statement, signed in Moscow by the presidents of Russia, Ukraine, and the United States on January 14, 1994, secured Russian access to the storage sites for monitoring safety of the warheads. But the statement did not dispute the future Ukrainian control over the storage sites.

In late 1993, the Ukrainians began removing warheads from the ballistic missiles. The removal, transportation, and storage were provided by Ukrainian troops. This became a watershed, which marked the transition of Kiev's command and control into a stage of more autonomous and active operations. For the first time, the Ukrainian troops, on their own initiative, physically touched nuclear weapons. If the warheads were equipped with blocking devices, the "touching" cannot be interpreted as the establishment of Ukraine's positive control over the warheads. Nevertheless, an important milestone in that direction has been passed.

The redundancy of negative control over stored warheads is less reliable than that on the warheads mounted on the missiles. Even if the warheads are equipped with blocking devices, unauthorized access to them can be obtained by overcoming only one blocking system. In the case of mounted warheads, additional codes permitting a launch of the missile, as well as a relevant targeting program, are required.

Under Ukraine's conditions, negative control on storage sites is further degraded by an absence of different subordination of custodial and launching troops. Both troops are commanded by TsAU SYaS. Being a monopolist in so-called "administrative" control, the directorate pos-

sesses much greater room for maneuvering than its Russian colleagues enjoy vis-a-vis Russian forces. It seems that the Ukrainian political leadership has few opportunities to prevent an unauthorized activity initiated by their own military. In that sense, regular Russian inspections of the storage sites could represent the only independent eye watching the developments at the Ukrainian bases.

POTENTIAL CHALLENGES TO THE INTEGRITY OF THE C³I SYSTEM

Potential challenges to the integrity of the Russian C³I system can be divided into three categories:

- 1) whether Ukrainian "administrative" control will transform into Kiev's ability to use strategic weapons deployed there;
- 2) whether an embryonic Ukrainian C³I could provide a reliable guarantee against access to the weapons, authorized by neither Russian nor Ukrainian political leaders;
- 3) whether Russian negative control will collapse due to domestic instability.

Among the challenges, the first two represent the biggest concern.

The Ukrainian Challenge

The ability of CIS states to assert positive control over strategic nuclear weapons deployed on their territories is a subject of wide discussion. Not having access to the codes, which are kept in Moscow, the CIS authorities are not able to launch or re-target missiles, or activate warheads even with the cooperation of personnel at missile bases. They would have to initiate a large-scale research and develop-

ment (R&D) program directed at overcoming the existing blocking devices, installed on ICBMs and nuclear warheads, and elaborating new targeting systems for ballistic and cruise missiles. All this requires significant know-how, together with access to relevant R&D and production facilities. Among non-Russian states, only Ukraine holds some segments of the necessary infrastructure.

Ukrainian officials consistently deny any accusations that they are working on establishing positive control over strategic weapons deployed in Ukraine. In his February 1994 address to Verkhovna Rada, President Kravchuk stated that his country was technically unable to install effective control over the weapons. However, some developments in this sphere have allowed some experts to come to the conclusion that in reality the Ukrainian military is gradually implementing a policy directed at obtaining full positive control. Perhaps, that policy is driven by the military's own ambitions and was not sanctioned by the political leadership, but this does not make it less dangerous.

The coordinated activity of a relatively well-functioning military machine in Ukraine certainly has a greater chance of obtaining control of nuclear arsenals than any ill-prepared, nuclear illiterate and uninformed terrorist group, especially if the machine enjoys a complete subordination of the troops exploiting and guarding the weapons. As discussed above, Ukraine's establishment of "administrative" control, although it might be insufficient itself, provides an absolutely necessary precondition for establishing positive control.

Ukraine implemented some other

measures that could facilitate its transition to a nuclear weapons state. Reportedly, in 1993 then-Defense Minister Konstantin Morozov issued a directive ordering the commencement of R&D work aimed at overcoming existing blocking devices and re-targeting ballistic missiles at Russian targets. An incident, that occurred in late 1993, when two warheads from SS-24 ICBMs were damaged and had to be sent to Russia for dismantlement, is sometimes believed to be the result of a failed attempt to overcome blocking devices installed on the warheads.

The Ukrainian position in negotiations on its nuclear disarmament also might reflect some plan to maintain a technical ability to gain a nuclear status in the foreseeable future. The Ukrainians began to remove warheads, not from relatively obsolete, Russian-made SS-19 ICBMs, but from the newest SS-24 missiles, which were produced in Pavlograd Mechanic Plant located in Ukraine. Some analysts quickly evaluated that as evidence that Kiev was committed to nuclear disarmament. But, a closer analysis leads to the opposite conclusion. Targeting programs and blocking devices for SS-24s were mainly developed and produced in Russia; the Ukrainian participation in R&D and production of the systems designed for SS-19 ICBMs was much larger. In this context, the unwillingness to remove warheads from the SS-19s could be explained by the Ukrainian military having more confidence that they would be able to re-target and overcome blocking devices installed on the deployed missiles with the warheads mounted on them.

There is some evidence that Ukrainian negotiators oppose elimination of missiles silos. If so,

this demonstrates Ukraine's intention to keep open a door to nuclear status even if Ukraine formally adheres to the Non-Proliferation Treaty. It also explains a controversial Ukrainian position fixed in the Trilateral Statement. While pledging to remove all 460 warheads from the SS-24s ICBMs within a period of 10 months, Kiev agreed to transfer to Russia only 200 of the warheads. Thus, it reserved the right to keep the remaining 260 warheads in storage sites located in Ukrainian territory and guarded by Ukrainian troops.

Paradoxically, for the Ukrainians it might be easier to establish positive control over the SS-24s and their warheads through a de-activation of deployed missiles. Overcoming the warheads' blocking devices could be less complicated if the warheads were stored. Also, it might be simpler for the Ukrainians to produce new missiles at the Pavlograd Plant equipped with a primitive, Ukrainian-made targeting system, than to modify an existing targeting system incorporated into already deployed ICBMs. Therefore, one can imagine a scenario according to which Ukraine would begin to overcome blocking devices installed on the 260 warheads that will be removed from missiles and remain in Ukraine. At the same time, the deployed SS-24 ICBMs will be removed from their silos, and the silos will be preserved in operational condition. As soon as progress in neutralizing the devices and developing targeting system is achieved, a decision on resuming the production of SS-24s could be made. Then, the new missiles could be deployed in existing silos with the old warheads mounted on them.

Of course, to implement this sce-

nario, Ukraine would have to organize its own production of raw materials, spare parts, and liquid fuel for the missiles; in the past, all of them were imported from Russia. Undoubtedly, Ukraine's industry is developed enough to do that. The main obstacle is Ukraine's inability to allocate the necessary financial resources for such an expensive program. The rapidly deteriorating economic situation there provides few chances to appropriate additional expenditures from the shrinking budget.

Moreover, even if Ukraine establishes positive control over the missiles, Kiev will face serious difficulties in their operational use. It could never be confident that the missiles would actually be capable of fulfilling missions as deterrents against Russia. Both types of missiles in Ukraine were designed to hit targets in North America. If the Ukrainians develop their own targeting and guidance systems, their missiles could reach only the distance of, for example, Siberian targets. While the SS-19 ICBMs were once tested with a range of around 1,500 miles, the minimum test flight for SS-24s was several times longer. This complicates their re-targeting at European Russia. It is this targeting, however, that is essential for establishing credible deterrence. Ukraine does not possess its own testing facilities or flight control stations. This prevents Ukraine from organizing any test flights for ICBMs. Kazakhstan, which theoretically is able to provide a test site, also lacks flight control facilities (most remain in Russia and are operated by Russians). This deprives Kiev of an opportunity to develop confidence in the reliability of its missiles.

A much higher-risk scenario is associated with gravity bombs and missiles, designated for heavy bombers, which might still be kept in storage sites near strategic air bases in Ukraine. Unlike ICBMs, targeting and launching codes released from NCA are not necessary to launch these weapons. Their blocking devices are certainly less sophisticated than those of ICBMs. Moreover, Ukraine has already established control over all the heavy bombers deployed on Ukrainian territory, and their pilots took oaths of loyalty to the Ukrainian people as early as the spring of 1992. With some modifications, the weapons could probably also be installed on other aircraft presently operated from Kiev.

In the case of cruise missiles, however, Ukraine could face much more significant difficulties than in developing its own targeting system for ICBMs. RKV-500 A and RKV-500 B ALCMs, which are designed to equip, respectively, Tu-95 M 16, and Tu-160 strategic bombers, represent very sophisticated and highly precise delivery vehicles with advanced targeting systems. During flight, the system scans the ground, comparing it with a detailed map that is kept in the memory of the on-board computer. To re-target the missiles at Russian cities, the Ukrainians must first obtain detailed maps of Russian territory with a precise system of coordinates. Such maps require either an effective intelligence network in Russia, or access to geodetic satellites. Kiev has neither of these.

Second, the maps must be translated into a computerized pattern readable by the targeting system and incorporated into computers on board the missiles. This necessitates highly skilled software experts, as

well as developed computer technologies. Ukraine did not possess these in the past. Finally, the Ukrainians must keep the computers and other targeting equipment operational. The present poor condition of other high-tech facilities and equipment in Ukraine, like the satellite control station near Yevpatoria (Crimea) or even strategic bombers, provides indirect evidence of the conditions of cruise missiles.

Another possibility is that Ukraine could use warheads from cruise missiles after some modifications, together with the warheads currently being removed from SS-24 ICBMs, as gravity bombs. The warheads could be deployed on the 37 heavy bombers currently under Ukrainian control. This option requires overcoming blocking devices installed on the warheads. Nevertheless, it is easier than deploying the warheads on the missiles because re-targeting and overcoming blocking devices on ICBMs would be avoided.

The negotiations that reportedly took place between the Russian and Ukrainian militaries, devoted to selling strategic bombers to Moscow, argue against Ukraine's attempting to create its own strategic bomber forces.¹⁹ But they also could be a result of interagency disagreements in Kiev. At a time when economic ministries are seeking to solve the debt problem, which could paralyze the vitally important Russian-Ukrainian trade, the military and especially TsAU SYaS are waiting to see the outcome of the talks in order to be able to paralyze the agreements through a powerful nuclear lobby in Verkhovna Rada.

One can conclude that since incorporation of the two "nuclear" armies into the Ukrainian Armed

Forces, Kiev's ability to establish its own positive control is constrained not by technical devices installed on strategic weapons, but by economic and political limitations. Because of its inadequate political control over the military forces that command the weapons, Ukraine may not act rationally in controlling strategic nuclear weapons on its territory despite its economic problems and international pressure.²⁰

Domestic Instability

The other set of risks stems from the risk of further disintegration of both Russia and Ukraine. An analysis of the feasibility of the disintegration of either state is beyond the scope of this article. However, it should be mentioned that the developments during the three years since the Soviet collapse show that centrifugal trends in Russia are consistently losing their momentum. Since 1991, no territory has proclaimed its independence. A leading separatist republic, Tatarstan, preferred to abandon its secessionist rhetoric and to conclude in the spring of 1994 an agreement with Moscow on "mutual delegation of responsibilities" with the federal authorities. Disputes between Moscow and all other regions (except a peripheral Chechen republic) have been transformed from the 1991-92 dilemma "to secede or not to secede" into more productive discussions on the improvement of relationships within the Federation.

If present trends continue, the worst case predictions--that like the Soviet Union, Russia will disintegrate into a dozen separate states, with Moscow controlling, at best, a narrow belt between Latvia and Tatarstan²¹--will be averted. Al-

though some risk of future ethnic tensions within the Federation remains, such tensions will hardly affect the nation's heartland, where the bulk of nuclear weapons are deployed. However, the safety of some nuclear bases could be challenged. For example, Mozdok strategic airfield with ALCM equipped Tu-95 MC 16 heavy bombers is located in the territory of the Republic of North Ossetia, just a dozen miles north of an Ossetian-Ingush ethnic conflict.

At the same time, disintegration of Ukraine seems to be gaining momentum. During the Ukrainian parliamentary elections in March and April 1994, the leading nationalistic movement Rukh received only a few seats in the new Verkhovna Rada. In Crimea and the Donetsk area in eastern Ukraine, local referendums were organized, and a majority of the population voted for closer relations with Russia. An impressive victory for the Communist Party of Ukraine in the eastern and southern regions could also provoke separatist trends in the anti-communist west, which previously firmly supported the state's integrity. The prospects of uncontrollable disintegration raise fears concerning a radical failure of the whole system of negative control, where the nuclear weapons might easily fall into unauthorized hands or play the role of the last argument in a dispute between separatists and central authorities.

Demoralized custodial troops could leave nuclear storage sites if they find themselves in the midst of civil unrest. The precedent has already been set by contingents of Soviet internal troops who left Karabakh in December 1991 without receiving any orders from Moscow. Those guarding nuclear stor-

age sites could also voluntarily take nuclear warheads to "their" side of the conflict. During clashes in Moldova in 1992, officers of the 14th Army deployed on the left bank of the Dniestr River openly threatened to support Slavic separatists against the Moldovan government in Chisinau.

The near-term risk arises from the weakening military discipline in the armed forces. Here, Ukraine once again seems more vulnerable than Russia. In Ukraine, salaries for military personnel are several times lower than those of their former colleagues, who remained in the Russian Armed Forces. Morale of the troops was significantly affected by the "Ukrainization" of the forces pursued by former Minister of Defense Konstantin Morozov. The subordination of the custodial and launching troops to the same body facilitates the troops' conspiracy on the nuclear bases. However, the main problem in Ukraine is the remaining uncertainty over who controls the troops operating the nuclear bases. Unclear distinctions between administrative control--fulfilled by the Ukrainians--and operational control--still provided (on paper) by the Russian side--create an environment, that encourages competition between Moscow and Kiev in gaining the troops' loyalty and, thus, undermines discipline.

Under these circumstances, the custodial troops, who do not receive sufficient payment and face a risk of firing for ethnic and language reasons, and could even be openly encouraged by both Russia and Ukraine to reject the orders of their commanders, might try to sell nuclear munitions to whoever will pay the highest price. They will only be following the example of their

"conventional" colleagues; conventional weapons from military storage sites have already become the main source of arms for feuding groups and criminals throughout the former Soviet territory.

In most cases, if a particular group were to obtain nuclear weapons, it would not be able to overcome the blocking devices. The danger is that such a group might physically destroy nuclear charges in order to contaminate areas controlled by the opposing side in a civil or ethnic conflict. There is also the possibility that nuclear weapons could be passed on to a third world regime or organized crime which, though unable to use the warhead, might use it as a form of nuclear blackmail.

CONCLUSIONS

From 1990 through 1992, massive withdrawals of tactical nuclear weapons took place in an area between the Elba River and the Chinese border. By the summer of 1992, the withdrawal of these weapons from all countries outside Russia was practically complete. Thus, nightmare scenarios involving the proliferation of Soviet tactical nuclear warheads among terrorist groups and regimes, and the specter of civil or ethnic wars involving nuclear weapons have been averted.

At the same time, however, significant challenges to the integrity of the C³I of the strategic nuclear forces have emerged. As a result of considerable unilateral efforts, Ukraine successfully created its own autonomous, although embryonic and incomplete, command and control system. In fact, it effectively prevented any potential Russian attempts to launch the strategic weap-

ons located on the Ukrainian territory without Kiev's permission. It also established the necessary conditions for a Ukrainian system of positive control. The recent removal of warheads from the SS-24 ICBMs deployed in Ukraine provided Ukrainian personnel with important physical access to the warheads. This access facilitated implementation of possible technical measures directed at overcoming the blocking devices that were installed on the warheads in order to prevent their unauthorized activation.

Official incorporation into the Ukrainian Armed Forces of the troops fulfilling routine inspection of the strategic nuclear weapons in Ukraine has led to a situation where Kiev's ability to establish positive control over the weapons is mainly limited not by technical, but by broader economic and political constraints. Insufficient political control over the military and the monopolistic role of a single military agency in controlling the weapons provide an opportunity for the military to ignore political decisions and to pursue its own nuclear policy.

In the near term, due to industrial, technological, and economic limitations, Ukraine is not likely to create reliable nuclear forces based on strategic ballistic missiles. A more attainable option is to modify warheads, kept in storage sites and designated for ballistic and cruise missiles, for use as gravity bombs. Potentially, the warheads could be mounted on Tu-160 and Tu-95 MC 16 heavy bombers; the pilots of these bombers took an allegiance to the Ukrainian people as early as the spring of 1992. After some modification, some other aircraft could possibly perform the delivery mission.

Even if Ukraine prefers not to obtain positive control over the nuclear weapons, the risk of unauthorized access to them might increase. Reliability of Kiev's negative control will be undermined by separatist trends strengthening throughout Ukraine, weakening political control over the military, inadequate organizational and technical protection of the weapons, and demoralization and impoverishment of custodial troops. This could lead to the transfer of nuclear weapons to unauthorized hands and the abandonment of the nuclear bases in a case of a direct threat to the security of custodial troops, or even the use or threats to use the weapons in domestic disputes.

Another set of less challenging risks arises from insufficient civilian participation in Russian nuclear decisionmaking. Because of the delays in the formal transfer of the strategic nuclear weapons from the CIS to Russian jurisdiction, the country's fragile democratic institutions were unable to capitalize on the favorable (pro-reform) domestic political situation that existed in 1992 and early 1993. The delay permitted the military to return to the old Soviet command and control pattern, with all its perceived deficiencies and controversies. Nevertheless, the Russian C³I simultaneously inherited important organizational and technical warranties, which had provided effective negative control over the world's largest nuclear arsenal for 30 years. Although the possibility of Russia's disintegration has considerably decreased since 1991, and the discipline among the military has been improved, potential challenges to the negative control from ethnic hostilities and criminal conspiracies cannot also be com-

pletely ruled out.

¹ Alexei Arbatov and Alexander Saveliev, "The Command and Communications System as an Element of Strategic Stability," *Mirovaya Ekonomika i Mezhdunarodnyye Otnosheniya* (Moscow), No. 12, 1987 (in Russian.)

² Yuri Kardashevsky, "In Whose Hands Is the 'Button of War'?" *Argumenty i Fakty* (Moscow), No. 52, 1991, p. 2 (in Russian.)

³ The briefcase was shown twice on Russian television in December of 1991. Each time a different style of case was depicted. In the first showing it was an attache case; the second time it was an old-fashioned, 1960's-design leather case. Both cases were black.

⁴ *Trud* (Moscow), October 27, 1992, p. 3.

⁵ Kardashevsky, *loc. cit.*, p. 2.

⁶ "Declaration of Alma-Ata, December 21, 1991," reprinted in *Pravda* (Moscow), December 23, 1991, p. 1 (in Russian.)

⁷ "Agreement on Common Measures Towards Nuclear Weapons, December 21, 1991," reprinted in *Pravda*, December 23, 1991, p. 2 (in Russian.)

⁸ See "CIS, Ukraine Differ on Nuclear Armaments," *Interfax* (Moscow), July 17, 1992.

⁹ Edward L. Warner III, "Command and Control on Soviet Nuclear Weapons and Risks Associated With an Uncertain Soviet Future," Statement Presented to the Defense Policy Panel of the Committee on Armed Services, U.S. House of Representatives, July 31, 1991, p. 5.

¹⁰ *Ibid.*

¹¹ The author's correspondence with Bruce Blair from the Brookings Institution and Valery Yarynich from IMEMO. See also Bruce Blair, "Russia's Doomsday Machine," *The New York Times*, October 8, 1993, p. A35; and Valery Yarynich, "The Doomsday Machine's Safety Catch," *The New York Times*, February 1, 1993, p. A17.

¹² There are some data that nuclear warheads designed for HBs are still being kept at a storage site at Uzin AFB in Ukraine. See *Izvestiya* (Moscow), March 26, 1992.

¹³ P. Felgengauer, "Ukraine Seeking Nuclear Independence," *Nezavisimaya Gazeta* (Moscow), March 14, 1992, p. 2.

¹⁴ Warner, *loc. cit.*, pp. 4-5.

¹⁵ Kardashevsky, *loc. cit.*, p. 2.

¹⁶ For a detailed, technical discussion of Ukrainian command and control issues, see Martin J. DeWing, *The Ukrainian Nuclear Arsenal: Problems of Command, Control, and Maintenance*, Working Paper No. 3, (Program for Nonproliferation Studies, Monterey Institute of International Studies, October 1993).

¹⁷ *Ibid.*

¹⁸ "The Concept of Ukrainian Leadership on Nuclear Weapons," interview with Leonid Kravchuk, President of Ukraine, *Rossiyskiye Vesti* (Moscow), December 24, 1992, p. 2 (in Rus-

sian).

¹⁹ Segodnya (Moscow), April 8, 1994, p. 1 (in Russian). The negotiations were interrupted, because the sides appeared unable to agree on the price: the Ukrainians asked Russia to forgive 800 billion rubles from their debt, while Russia agreed to reduce the debt only by 200 billion rubles.

²⁰ On these threats, see Seymour M. Hersh, "The Wild East," The Atlantic Monthly, June 1994.

²¹Such a scenario is described in Denis Dragunskiy's "Slavyanka Says Good-bye" Moskovskiy Novosti (Moscow), January 5, 1992, p. 20 (in Russian).