Introduction

This book discusses command and control of strategic nuclear weapons. Its goal is to facilitate cooperation in this field between official and independent experts in Russia, the United States and other countries, and to make these matters a subject of public discussion.

Today we are facing an obvious absurdity. On the one hand, as far as nuclear weapons themselves are concerned, the United States and Russia have become unprecedentedly open with each other, exchanging information that used to be completely secret during the Cold War. Now publicly accessible computer databases include information about various types of American and Russian ballistic missiles and nuclear warheads, their numbers, characteristics, location, design bureaus and production facilities. Experts on nuclear weapons from various countries hold regular meetings, and special organizations and departments within the power structures of both Russia and the United States have already been established in order to implement signed agreements on cooperation in this area. Regular mutual inspections of military bases, testing ranges and industrial enterprises are being conducted. The result of such decisive steps is evident: the process of nuclear arms reduction has started and is successfully continuing.

By the end of the 20th century, the American strategic forces had about 6,400 nuclear warheads; 54 percent of these warheads were submarine-launched ballistic missiles (SLBMs) (on board the Ohio-class nuclear-powered ballistic missile submarines – or SSBNs – armed with Trident-1 and Trident-2 SLBMs), 33 percent were on silo-based ICBMs (Minuteman-3 and the Peacekeeper), and 13 percent on board B-52 strategic bombers armed with air-launched cruise missiles. At the same time, Russia had about 6,600 strategic warheads counted under the terms of START I (5,800 of them were in operational status); 33 percent of these warheads were based on SSBNs, 55 percent on silo-based and mobile ICBMs, and 12 percent were carried by strategic bombers.[1]

At the same time, however, absolute secrecy reigns when it comes to command and control of nuclear weapons (in American terminology, C^3I – command, control, communications and intelligence). Two issues are of greatest importance here. First, what measures have been taken by the nuclear powers against accidental or unauthorized use of nuclear weapons, and how reliable are these measures (known as negative control)? Second, what is the ideology for hypothetical authorized employment of nuclear weapons?

Since these weapons exist, and are likely to continue to exist for the foreseeable future, there must also be a clear system of action for national command authorities (NCA) and combat duty crews at all levels in crisis situations. This is called positive control, the effectiveness of which should be estimated not only from the standpoint of providing robust deterrence against a potential attacker, but should also be viewed through the prism of negative control, which is dominant today.

Unfortunately, cooperation in this field between Russia, the United States and other nuclear powers is practically nonexistent. Data on command and control systems and concepts of use continue to be secret. Experts in C^3I do not meet, and urgent problems are not discussed. This is surprising. Nuclear weapons are not the only problem, and reduction of nuclear arsenals is not the only goal. Establishing global security and preventing any accidents with the nuclear monster are much broader and more important tasks on the long road of reductions. But while the level of nuclear *potential* is gradually declining, the level of *danger* is staying relatively the same. This is because to the common citizen, the end result is the same whether a nuclear conflict involves thousands of warheads or "only" dozens. Such an outcome must be prevented in principle, and this can be done only through the command, control and communication (C^3) system. In peacetime, nuclear weapons themselves only become deadly through a mistake in, or intentional misuse of, their command and control system.

Of course, one cannot assume *a priori* that dangers in this field already threaten the world. Perhaps problems do not exist, or that finding their solution can be postponed. However, ignorance and lack of information concerning these dangers weaken mutual trust and may result in considerable problems in the near future. Logic itself suggests the necessity of increased attention to the influence of command and control factors on strategic stability. There is no reason to wait. "Simple intuition suggests that omitting command parameters from consideration invites miscalculation."[2] Nevertheless, Russia and the United States have taken practically no steps in this direction. Why?

Perhaps it is because the subject of nuclear command and control is justifiably considered one of the most complex and delicate. One cannot blame the leaders of the nuclear powers for not understanding all the nuances of the command and control systems. After all, it is the business of technical experts. But at the same time, those in power, who are fully aware of the exceptional importance of command and control, are concerned about irreversible consequences for their national security in case these particular "cards" in their defense "hand" are played. Thus, it is the combination of two circumstances – fear of making an irreversible mistake, and the realization of their relative incompetence in this technologically complex field – that creates the "blockage at the top." This prevents C^3I experts of various countries from sitting around the same table and coming up with practical proposals to make these systems more secure and reliable.

This book proposes one of the possible approaches to initiating international cooperation on nuclear command and control. The main emphasis is not so much on a

traditional description of C^3 systems and the concepts of their employment, but rather on a logical and mathematical substantiation of the admissibility and necessity for open dialogue in the field of C^3I, within reasonable limits. Openness is the key to solving the numerous problems that stand in the way of strengthening civilian control over nuclear forces. It can be achieved without any risk to national security, and in fact, it may even be advantageous both for global security and economics.

Chapter 1 considers the general principles of nuclear command and control systems and their place and role in nuclear forces. It points to a number of the problems and potential dangers inherent to the operation of these systems, and demonstrates the undesirable consequences of complete secrecy. It proposes one possible approach to overcoming this absurdity, namely conducting combined theoretical studies on the effectiveness and permissibility (from the standpoint of national security) of reasonable mutual openness in nuclear command and control; then, if such effectiveness is proven, taking concrete mutual steps for strengthening strategic stability and global security.

Chapter 2 analyzes the major scholarly works on strategic C^3I. These works investigate practically all the major aspects of nuclear command and control, and emphasize the necessity of command and control when considering strategic stability, disarmament and global security. However, substantiating the necessity and possibility for international cooperation in C^3I needs more attention.

This is addressed in Chapter 3, which describes a logical, mathematical method for solving the problem of cooperation. This method was developed and tested on numerous occasions during the 1990s by the Russian military and academic research institutes, to substantiate the required composition and characteristics of strategic nuclear forces (SNF) and their command and control systems. The main conclusion is that *a nuclear power can, theoretically, be reliably guaranteed to retaliate against an attacker under any conditions*, irrespective of the size of prior preparations by the attacker to avoid retaliation (e.g. improvement of the offensive forces and methods for their employment, strengthening of ballistic missile defense – or BMD – increased survivability under conditions of nuclear war, etc.). The method allows analysts, with an accuracy acceptable for practical purposes, to find a quantitative measure for the probability that the required level of retaliation will be implemented, and to correlate the required values of this index on the effectiveness of SNF (including their command and control system) with necessary expenditures.

This approach is practical only under conditions of mutual openness regarding certain aspects of the C^3 systems. Given the theoretically proven assured retaliation, it is possible to move toward this kind of openness while maintaining national security.

Chapter 4 describes the Russian and U.S. nuclear command and control systems, including their history, organization and operational principles. Despite the fact that the C^3 topic is practically closed in Russia, in recent years a considerable number of independent and official experts described elements of strategic nuclear C^3 system, including their real names, missions and some characteristics. Unfortunately, these

disparate data, presented by Russian authors, do not provide an objective picture of the system as a whole. It is also unfortunate that some of these data, and especially a number of Western publications about the Russian strategic C^3, distort the real picture. Thus, I have undertaken in this book to give the previously published data on the Russian C^3 a certain logical structure. In other words, the readers will find here not only the list and brief description of the C^3 elements, but, more importantly, an explanation as to why these elements have been created, what their roles are in the general C^3 system, and what their impact is on strengthening nuclear deterrence. Some information on the systems' designers and manufacturers is also provided, and future prospects are analyzed. This will help maintain strategic stability and counter uninformed speculation on this crucial subject. These issues are discussed primarily in relationship to the first three components of C^3I: command, control and communications. Considerable attention is paid to the Russian strategic rocket forces (SRF) C^3. Information about C^3 systems for the sea-based and air legs of the nuclear triad, as well as for the SNF as a whole, is less detailed.

There is also a brief description of the U.S. nuclear command and control system.

Chapter 5 contains a comparative analysis of some problems in Russian and U.S. C^3. Using examples of negative control, delegation of authority, "dead hand"-type systems, concepts of nuclear weapons use, etc., the chapter demonstrates that these problems are largely similar for both systems, and that it is better to solve them cooperatively.

Chapter 6 proposes some concrete measures for cooperation between Russian and U.S. C^3 experts. It contains a list of questions in the field of nuclear command and control where unclassified publications, as well as discussions by official and independent experts, should be permitted. Questions regarding areas where such openness is impossible are listed as well.

Analysis of the problems listed above is accompanied by references to opinions, conclusions and proposals contained in works by prominent specialists on the subject, mostly Americans. In general, the author's views, based for the most part on those of Russian scholars, largely support the opinions of non-Russian experts, a fact which suggests considerable potential for cooperation. At the same time, the author proposes several alternatives to the American specialists' views, which can also be seen, positively, as material for beginning a discussion on the development of mutually acceptable recommendations.

As noted above, the abbreviation C^3 means "command, control, *communications*." This retains its meaning throughout the book. The author, however, has decided to change this meaning slightly in the title ("command, control, *cooperation*"), in order to immediately draw the reader's attention to the book's foremost concern.