Chapter 4
Nuclear Command, Control, and Communications System

4.1 Overview

The U.S. nuclear command, control, and communications system refers to the collection of activities, processes, and procedures performed by appropriate military commanders and support personnel that—through the chain of command—allow for senior-level decisions on nuclear weapons employment to be made based on relevant information and subsequently allow for those decisions to be communicated to forces for execution.[1] The nuclear C3 (NC3) system is an essential element to ensure crisis stability, deter attack against the United States and its allies, and maintain the safety, security, and effectiveness of the U.S. nuclear deterrent. The purpose of the nuclear C3 system is to provide the president with the means to authorize the use of nuclear weapons in a crisis and to prevent unauthorized or accidental use. The former is accomplished through the assets of the nuclear C3 system, managed by the Military Services, nuclear force

[1] The Nuclear Command and Control System is made possible through the cooperation of multiple departments and agencies within the United States Government; this chapter focuses on the Department of Defense-related portion of the system, hereafter referred to as the *nuclear C3 system*.

commanders, and the defense agencies. (For more information on the prevention of unauthorized or accidental use, see Chapter 5: *Nuclear Safety and Security*.)

4.2 Nuclear Command and Control

Nuclear command and control (C2)—or the exercise of authority and direction by the president through established command lines over nuclear weapons operations, as the Chief Executive over all nuclear weapon activities that support those operations, and as the Head of State over required multinational actions that support those operations—is provided through a survivable "thin line" of communications and warning systems that ensure dedicated connectivity from the president to all nuclear-capable forces. The fundamental requirements of nuclear C2 are paramount; nuclear C2 must be assured, timely, secure, survivable, and enduring in providing the information and communications for the president to make and communicate critical decisions without being constrained by limitations in the systems, the people, or the procedures that make up the full nuclear C3 system.

The president's ability to exercise these authorities is ensured by the Nuclear Command and Control System (NCCS)—the facilities, equipment, communications, procedures, and personnel that are essential for supporting the president's nuclear C2. The NCCS is an interagency system that includes stakeholders from the White House, the Department of Defense (DoD), the Department of State (DOS), the Department of Homeland Security (DHS), the Department of Justice (DOJ)/Federal Bureau of Investigation (FBI), the Department of Energy (DOE), and the Director of National Intelligence (DNI).

The DoD has been directed to ensure that the C2 architecture for the nuclear deterrent can serve as the core component of a broader *national* command, control, communications, computers, and intelligence system supporting the president. Because the NCCS is an interagency system, this chapter will use the term *nuclear C3 system* to refer to the DoD portion of the NCCS that would be used in responding to a nuclear crisis.[2]

4.3 Nuclear C3 Requirements, Functions, and Elements

National Security Presidential Directive (NSPD)-28, *United States Nuclear Weapons Command and Control, Safety, and Security*, is the authoritative source for NC3 requirements.

[2] The nuclear C3 system can also prove critical for U.S. response to other significant national events, such as terrorist attack or natural disaster, where there is a need for continuity and the means to ensure the performance of essential government functions during a wide range of emergencies. Nuclear crisis is the worst-case scenario.

The requirements have been translated into the functions that the nuclear C3 system must support: nuclear force planning; situation monitoring, including an integrated tactical warning and attack assessment of bomber threats and missile launches; senior leader decision making; dissemination of presidential force-direction orders; and management of geographically dispersed forces. Many factors—both current and future projections—can influence presidential decision making. Thus, the command elements of the nuclear C3 system must maintain constant awareness of world events, both through classified means—usually through access to national intelligence systems and other sensors—and from open sources such as cable news stations, weather forecasts, and other government sources.

The elements of the supporting NCCS provide the means to perform the functions of nuclear C3 for the president and his senior advisors in a nuclear crisis.

4.3.1 Nuclear C3 Requirements

There are a host of nuclear C3 requirements stated in national and DoD policy; among these are the requirements that nuclear C3 must be reliable, assured, enduring, redundant, unambiguous, survivable, secure, timely, flexible, and accurate. These requirements have been translated into specific, measurable, and testable criteria by which to evaluate the performance of the nuclear C3 system through exercise, testing, and analysis.

Two requirements have recently received additional attention as a result of new policy. The first mandates that mission-critical nuclear C3 system facilities and equipment must be built to resist ("hardened" against) the effects of a nuclear explosion, especially electromagnetic pulse (EMP), which can interrupt or destroy sensitive electronics. (See Appendix F: *The Effects of Nuclear Weapons*, for more information about nuclear effects.)

There exist five nuclear C3 functions that encompass all of the nuclear C3 activities performed by DoD personnel as they carry out their assigned military missions: force management, planning, situation monitoring, decision making, and force direction.

The second requirement directs the progression to modern systems capable of operating on internet-like networks that provide survivable, reliable support for senior U.S. Government officials, the U.S. military, and allies, as appropriate. While the implications and applicability of this policy—referred to as *net-enabled* or *net-centric*—are being considered, it is still necessary to protect critical information and information systems against cyber attack or network intrusion.

4.3.2 Nuclear C3 Functions

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Force Management

Force management includes the assignment, training, deployment, maintenance, and logistic support of nuclear forces and weapons before, during, and after any crisis. This understanding of force readiness status enables key leaders to quickly ascertain the ability to initiate or continue operations.

Planning

Planning involves the development and modification of plans for the employment of nuclear weapons and other operations in support of nuclear employment. Planning enables U.S. forces to survive and to respond quickly to any contingency, a necessary condition given the rapid flight time of ballistic missiles.

Situation Monitoring

Situation monitoring comprises the collection, maintenance, assessment, and dissemination of information on friendly forces, adversary forces and possible targets, emerging nuclear powers, and worldwide events of interest. Effective situation monitoring creates a comprehensive picture based on formal sources, such as warning data from system sensors and field commander assessments, classified intelligence sources, and unclassified “open” sources.

Decision Making

Decision making refers to the assessment, review, and consultation that occurs when the employment or movement of nuclear weapons is considered for the execution of other nuclear control orders. This function relies on time-critical secure phone (and sometimes video) conferencing to enable the president to consult with his senior advisors, including the secretary of defense and other military commanders. Decision support tools and rapid reliable connectivity are critical to this function.

Force Direction

Force direction entails the implementation of decisions regarding the execution, termination, destruction, and disablement of nuclear weapons. This function relates to nuclear surety,

accomplished through procedures, physical security (e.g., gates, guns, and guards), and internal warhead locks and disabling mechanisms to prevent unauthorized use of nuclear weapons. It also relies on positive control, accomplished through procedures, continuous training, equipment, and communications that ensure the president's nuclear control orders are received and properly implemented through the nuclear C3 system. (For more information on nuclear physical security, see Chapter 5: *Nuclear Safety and Security*.)

4.3.3 NCCS Elements

The NCCS is composed of five elements: facilities, equipment, communications, procedures, and personnel. These elements compose the infrastructure that supports the president—through his military commanders—in exercising his authority over U.S. nuclear weapons operations, enabling the performance of the five nuclear C3 functions.

Personnel

NCCS personnel include the operators and maintainers of the facilities, equipment, communications, weapons, and delivery systems.

Procedures

NCCS procedures direct the actions of the people who operate nuclear systems.

Facilities

NCCS facilities are fixed (for example, the National Military Command Center (NMCC)), ground mobile (for example, the tractor trailer-mounted Mobile Consolidated Command Center (MCCC)), and airborne (for example, the E-4B National Airborne Operations Center (NAOC)), a highly modified Boeing 747 aircraft, and the E-6B Take Charge and Move Out (TACAMO)/Airborne Command Post, a highly modified Boeing 707 aircraft.

Figure 4.1
National Military Command Center

The primary nuclear C3 facility is the National Military Command Center (Figure 4.1) located in a shielded room within the Pentagon. The NMCC provides daily support to the president, the secretary of defense, and the Joint Chiefs of Staff, allowing for the monitoring of nuclear forces and ongoing conventional military operations.

In a crisis situation, the Alternate National Military Command Center (ANMCC) (Figure 4.2) can be activated to serve as a fully functional

Figure 4.2 Alternate National Military Command Center

alternate location. The ANMCC is located outside of Washington, D.C.; it is shielded from electronic damage from a nuclear blast and physically protected inside a mountain. The ANMCC is capable of being locked down behind massive blast-hardened doors to operate in a fully self-contained manner for a required period of time. When not fully functional, the ANMCC is minimally staffed. A second backup location to the NMCC is located underneath the United States Strategic Command (USSTRATCOM) Headquarters at Offutt Air Force Base in Nebraska. The USSTRATCOM Global Operations Center (GOC) enables the USSTRATCOM Commander to conduct nuclear C3 while also enabling the day-to-day management of forces and the monitoring of world events.

Figure 4.3
Mobile Consolidated Command Center

The MCCC (Figure 4.3) is a set of trucks that may deploy during a crisis to serve as a survivable road-mobile backup to the NMCC. Its survivability is achieved through mobility, the ability to host large numbers of battle staff and operators, and a diversity of communications capabilities that make it a key element of the overall nuclear C3 system.

Figure 4.4
E-4B National Airborne Operation Center (NAOC)

If fixed command centers are destroyed or incapacitated, several survivable alternatives exist to which nuclear C3 operations can transfer, including the E-4B NAOC and the E-6B (Figures 4.4 and 4.5). A NAOC aircraft is continuously ready to launch within minutes, from even random basing locations, thus enhancing the survivability of the aircraft and the mission. The E-6B serves as an airborne command post; in this capacity, it acts as an airborne backup of the GOC. Because of this role, the E-6B performs two additional key missions: first, as the Airborne Launch Control System, the aircraft has the ability to launch Minuteman III ICBMs as back-up to the land-

Figure 4.5 E-6B TACAMO

based launch control facilities; second, in its TACAMO role, it can relay presidential nuclear control orders to Navy nuclear submarines and Air Force nuclear missiles and bombers. It can deploy a 2½-mile-long trailing wire antenna and communicate directives to the nuclear forces over this survivable radio system, or over other radio or satellite systems.

Equipment

NCCS equipment includes information protection (cryptological) devices and the sensors—radars and infrared satellites, fixed, mobile and processing systems—of the Integrated Tactical Warning/Attack Assessment (ITW/AA) System.

ITW/AA comprises rigorously tested and certified systems that provide unambiguous, reliable, accurate, timely, survivable, and enduring warning information of ballistic missile, space, and air attacks on North America. In general, the ITW/AA process includes four steps to support the decision making process: surveillance,[3] correlation,[4] warning,[5] and assessment.[6] To assist in ITW/AA decisions, two independent information sources using different physical principles, such as radar and infrared satellite sensors associated with the same event, help clarify the operational situation and ensure the highest possible assessment credibility. Regardless of the type of event, assessments are passed over an emergency telephone conference to the president, the secretary of defense, and the chairman of the Joint Chiefs of Staff. The assessment details whether an attack is occurring against North America or U.S. space assets.

Communications

The NCCS relies on terrestrial (e.g., land-based secure and non-secure phone lines and undersea cables), airborne relay (e.g., E-4B and E-6B), and satellite (commercial and military) sensors to transmit and receive voice, video, or data. The ability to move trusted

[3] *Surveillance* is the detection, collection, identification, processing, and reporting of ballistic missile, atmospheric, and space events by means of a worldwide network of ground- and space-based sensors.

[4] *Correlation* is the collection, integration, analysis, and interpretation of surveillance data along with intelligence information on all potentially hostile events.

[5] *Warning* is the process that uses automated displays of missile, atmospheric, and space events, confirmed by voice conferences to sensor sites, to assess the validity of warning information. Intelligence information can further corroborate sensor data.

[6] *Assessment* evaluates the likelihood that an air, missile, and/or space attack is in progress against North America or an ally. Missile or air attack assessment is based on a combination of sensor information and the judgment of the Commander, North American Aerospace Defense Command (NORAD) of its validity. The commander, USSTRATCOM validates missile and space warning information for areas outside North America and provides an assessment of potential attacks on U.S. and allied space assets.

data and advice from sensors to correlation centers, from presidential advisors to the president, from the president to the National Military Command System (NMCS), and from the NMCS to the nuclear weapons delivery platforms depends on nuclear C3 transport systems (Figure 4.6). These comprise a myriad of terrestrial, airborne, and satellite-based systems ranging in sophistication from the simple telephone, to radio frequency systems, to government and non-government satellites. Some of these systems are expected to be able to operate through nuclear effects, while are expected to be subject to nuclear effect disruption for periods ranging from minutes to hours.[7]

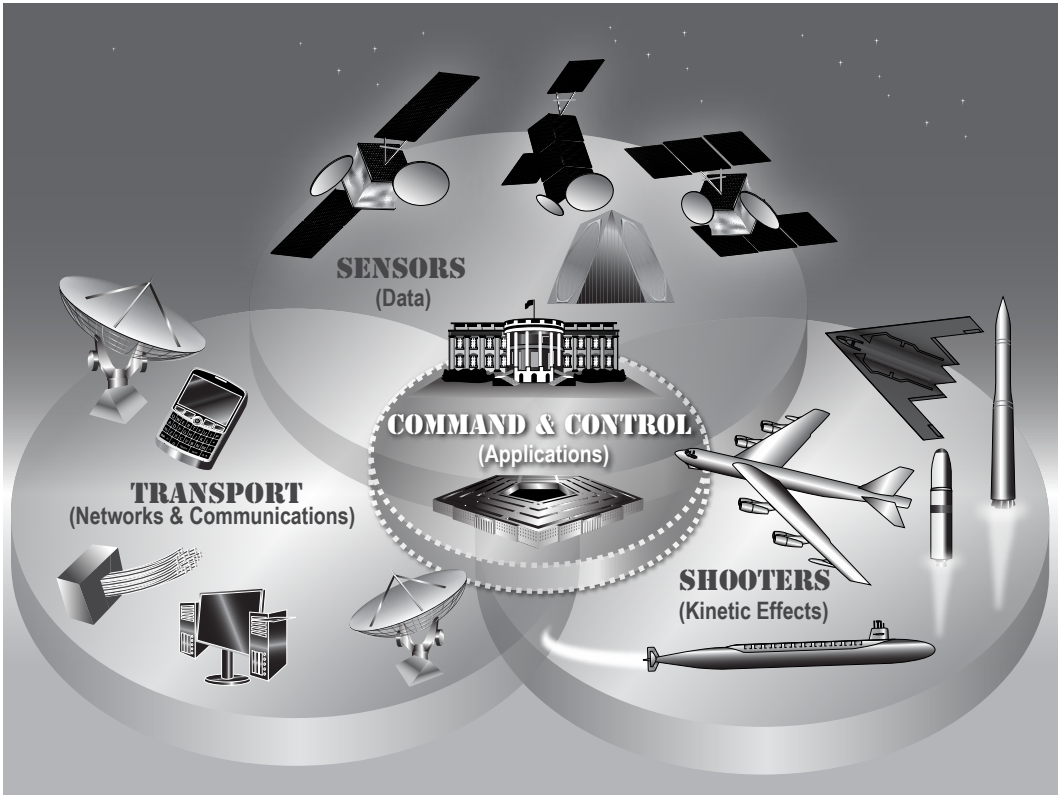

Figure 4.6 Nuclear C3 Transport Systems

[7] As with other critical elements of the nuclear C3 system, even communications systems whose frequency spectrum is expected to be available in a nuclear-affected environment are susceptible to physical effects, including burnout or temporary disruption, due to the effects of a nuclear detonation on their electronic components if they are not hardened against such effects.

4.4 Current U.S. Nuclear C3 Architecture

The present U.S. nuclear C3 architecture can be described in two layers. The first layer is the current day-to-day/crisis architecture, which can also be described as a "thick-line" system. This architecture supports current U.S. national policy in that it: responds under all conditions in both peacetime and war to provide the means to exercise positive control and direction by the president, the secretary of defense, and combatant commanders; provides secure, reliable, immediate, and continuous access to the president; and provides robust C2 over nuclear and supporting government operations.

The second layer provides the survivable, secure, and enduring architecture known as the "thin-line." The "thin-line" responds to policy that requires assured, unbroken, redundant, survivable, secure, and enduring connectivity to and among the president, the secretary of defense, the chairman of the Joint Chiefs of Staff, and the designated commanders through all threat environments to perform all necessary C2 functions. The "thin-line" C3 architecture must be sustained and supported during any modernization effort to ensure it can meet presidential requirements.