USAF Scientific Advisory Board Study
Nuclear Command, Control, and Communications

Study Abstract

Within the Department of Defense (DoD), Nuclear Command, Control, and Communications (NC3) is a part of a larger set of systems referred to as the National Leadership Command Capability (NLCC) communications capability. NLCC includes Presidential National Voice Conferencing, NC3 and Continuity of Operations/Continuity of Government communications. The United States Air Force (USAF) is responsible for about 75% of the NC3 system. Modernization has resulted in a system which is a hybrid of older and newer elements. The system is key to maintaining connectivity at the National senior leader level in times of crisis and to the ability of the nation to exercise the bomber and Inter-Continental Ballistic Missile (ICBM) legs of the triad.

The USAF Scientific Advisory Board (SAB) was asked to undertake a study to understand the capabilities and vulnerabilities of the NC3 system, including its performance during a nuclear event, cyber mission assurance of the system and its underlying architecture, and the sustainment of the system. The study Terms of Reference (TOR) specifically asked the SAB to:

- Identify and characterize the existing elements of the NC3 system, their criticality and their current state of performance with particular emphasis on the USAF bombers and ICBMs
- Review the upgrade plan for the system and any auxiliary infrastructure elements including activities to date and future efforts.
- Review efforts to date to understand the networks and pathways which constitute the NC3 system with particular emphasis on the underlying network architecture and any components of that architecture which have transitioned to an IP-based architecture.
- Assess the sustainment plan for the NC3 system and address any identified shortcomings which would impact NC3 capability.
- Examine robustness of the upgraded system in a nuclear environment
- Evaluate the ability to maintain mission assurance from a cyber-perspective and ways of mitigating any potential shortfalls.
- Recommend investments including S&T to redress any identified deficiencies.

The Study conducted a comprehensive assessment of the NC3 system with a primary focus on how the system supports decision making, force direction and force management. The SAB interacted and gathered extensive data from a wide cross section of USAF, DoD and federal research organizations including: Air Force Global Strike Command (AFGSC), Air Force Space Command (AFSPC), Headquarters Air Force A10 (HAF-A10), Air Force Nuclear Weapons Center (AFNWC), US Strategic Command (USTRATCOMM), DOD-Chief Information Officer (DoD-CIO), DoD Acquisition, Technology and Logistics (DoD ATL), DoD Policy, Defense Information Systems Agency – Joint Systems Engineering and Integration Office (DISA-JSEIO), United States Navy (N2/N6), National Security Agency (NSA), White House Military Office (WHMO), USAF Research Laboratory (AFRL), MIT Lincoln Laboratory, Johns Hopkins University Applied Physics Laboratory, Sandia National Laboratory, and MITRE.

Consistent with the 2010 Nuclear Posture Review, the Study determined that the range of scenarios that the NC3 system must operate in has greatly expanded since the end of the Cold War. The Study developed significant findings and recommendations in the areas of: USAF NC3 architecture and sustainment, cyber risk and resiliency, assured beyond line of sight communications, and decision making when communications are stressed.