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COMMUNICATIONS FOR SAFEGUARD

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ABSTAINER

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Remarks on the objectives, overall system description, historical evolution, and the Safeguard system organization lead into a discussion of communications for the Safeguard Ballistic Missile Defense System. The communications organization, Safeguard Communications Agency (SAFCA), is discussed. Also discussed are unique communications requirements, Safeguard deployment, and the manner in which SAFCA is solving the communications problems.

COMMUNICATIONS FOR SAFEGUARD

With the "winding down" of the Vietnam War and the cutback in the strength of our Armed Forces and defense spending, I believe it is appropriate that we reconsider the elements that will enable us to maintain parity and bargain on an equal basis with the major powers of the Communist world. One of the key elements is our ability to defend ourselves against an ICBM attack and thus retain a retaliatory capability if attacked. Our future ICBM second strike capability will be reliant upon the Safeguard Ballistic Missile Defense (BMD) System that is now under construction. I believe that this System, together with our nuclear offensive capability, will be the primary U.S. deterrent against nuclear attack for the next several decades. Paradoxically, although the Safeguard System is essential and critical to our national security, it consumes an appreciable part of our defense budget. The estimated cost for the first three Safeguard sites is $6 billion.

The Safeguard System contains several equally important major subsystems. These are radars, missiles, facilities, computers, and communications. This article discusses one of these, communications, after a lead-in discussion of Safeguard System objectives and overall organization.

The objectives of the Safeguard Ballistic Missile Defense System were defined by President Nixon in a 14 March 1969 speech. These objectives are to:

(1) Protect the U. S. land-based nuclear retaliatory forces from an attack by the USSR.

(2) Defend the U. S. against Communist China nuclear attack.

(3) Protect the U. S. against accidental nuclear attacks from any source.

These objectives have not changed since being announced by the President.

Full Safeguard deployment consists of twelve weapon system complexes that are located throughout the United States. They extend from Southern New England to the Florida/Georgia area on the East coast and from the upper Northwest to Southern California on the West coast. Other sites are located from the Canadian border southward to Texas in the central part of the United States. Congress originally approved two complexes for deployment. These are located in the vicinity of Grand Forks AFB, North Dakota and Malmstrom AFB, Montana. Congress has since given the go-ahead for deployment of a third complex in the vicinity of Whiteman AFB, Missouri, and for planning for a fourth complex in the vicinity of Warren AFB, Wyoming.

In broad terms the Safeguard concept is to deploy a mix of long and short range radars and missiles in weapon system complexes to detect and destroy threatening incoming ballistic missiles. Reaction times dictate that most Safeguard System components and actions be computer directed. Positive human control, however, may be employed by manual means.

The major Safeguard System components are:

(1) Perimeter Acquisition Radar (PAR) - Radar for long range surveillance and target acquisition. This is a single antenna radar that faces in the general direction of the threat. The PAR antenna is built into the support building which rises to a height of approximately 134 feet. The PAR building has walls of up to seven feet of reinforced concrete.

(2) Missile Site Radar (MSR) - Radar used for short range search, target acquisitions, and interceptor control. This radar has four antennae that provide 360-degree coverage. The MSR antennae are built into the support building which rises approximately forty feet above ground. The MSR building has walls of up to four feet of reinforced concrete.

(3) Remote Sprint Launch (RSL) Site - A remote launch site, associated with the MSR, that furnishes a capability to launch Sprint missiles at a distance of approximately twenty miles from the MSR.

(4) Spartan Missile - A three stage, solid propellant missile that carries a nuclear warhead and is designed for long range interception.

(5) Sprint Missile - A two stage, solid propellant missile that carries a nuclear warhead and is designed for short range interception.

(6) Computer Subsystem - Executes the automatic functions required for effective and timely weapon system operations. This subsystem also provides displays and manual entry data at appropriate command levels so that humans can monitor, override, initiate, or modify automatic actions.

(7) Communications Subsystem - Provides overall command and control and the interchange of computer data required for such things as nuclear release, target tracking and hand-off, and missile availability and status. This subsystem will be discussed in greater detail later.

The Safeguard Ballistic Missile Defense System evolved from the long term Army Research and Development Program that included Nike-Zeus, Nike-X, and Sentinel.

The Secretary of Defense selected the Army to be responsible for the Safeguard System in September 1967. It was then called Sentinel. At that time, Department of Army appointed LG Starbird as System

Manager. During his tenure, General Starbird was personally responsible for several management innovations. Through his outstanding leadership and management ability, the Safeguard Program (considered to be the most complex and technically difficult program ever attempted) has progressed steadily forward. General Starbird retired on 31 March 1971 and was replaced by LG Walter P. Leber, the current System Manager.

A Safeguard System office was created within the office of the Chief of Staff, Army. Although the system was renamed Safeguard in 1969, all other aspects of the Sentinel organization remain the same.

The Safeguard System Manager has overall responsibility for Safeguard matters and exercises staff supervision over all elements of the Army on matters relative to Safeguard. The System Manager has his own staff and operates from the Commonwealth Building in Arlington, Virginia.

Two field organizations have been established under command of the System Manager to plan, develop, and deploy the Safeguard System. The Safeguard System Command, located at Huntsville, Alabama, is responsible for development and acquisition of the weapon system to include the missiles, radars, computers, and other weapon system hardware and software. The Safeguard System

Command also exercises financial and configuration management for the Safeguard System. Also under the command of the Safeguard System Manager is the Safeguard System Evaluation Agency located at White Sands, New Mexico. The Safeguard System Evaluation Agency has the mission to perform a continuing independent evaluation of the Safeguard System.

The U.S. Army Corps of Engineers Division a ntsville, Alabama, is responsible for acquiring real estate and designing and constructing Safeguard facilities.

The Safeguard Logistics Command, also located at Huntsville, Alabama, has been established by the Commanding General, Army Materiel Command, to develop and implement a logistics system to support the Safeguard weapon system.

Another special Safeguard activity is the Safeguard Central Training Facility, located at Fort Bliss, Texas. This facility is operated by the Continental Army Command to conduct off-site training in Safeguard peculiar skills.

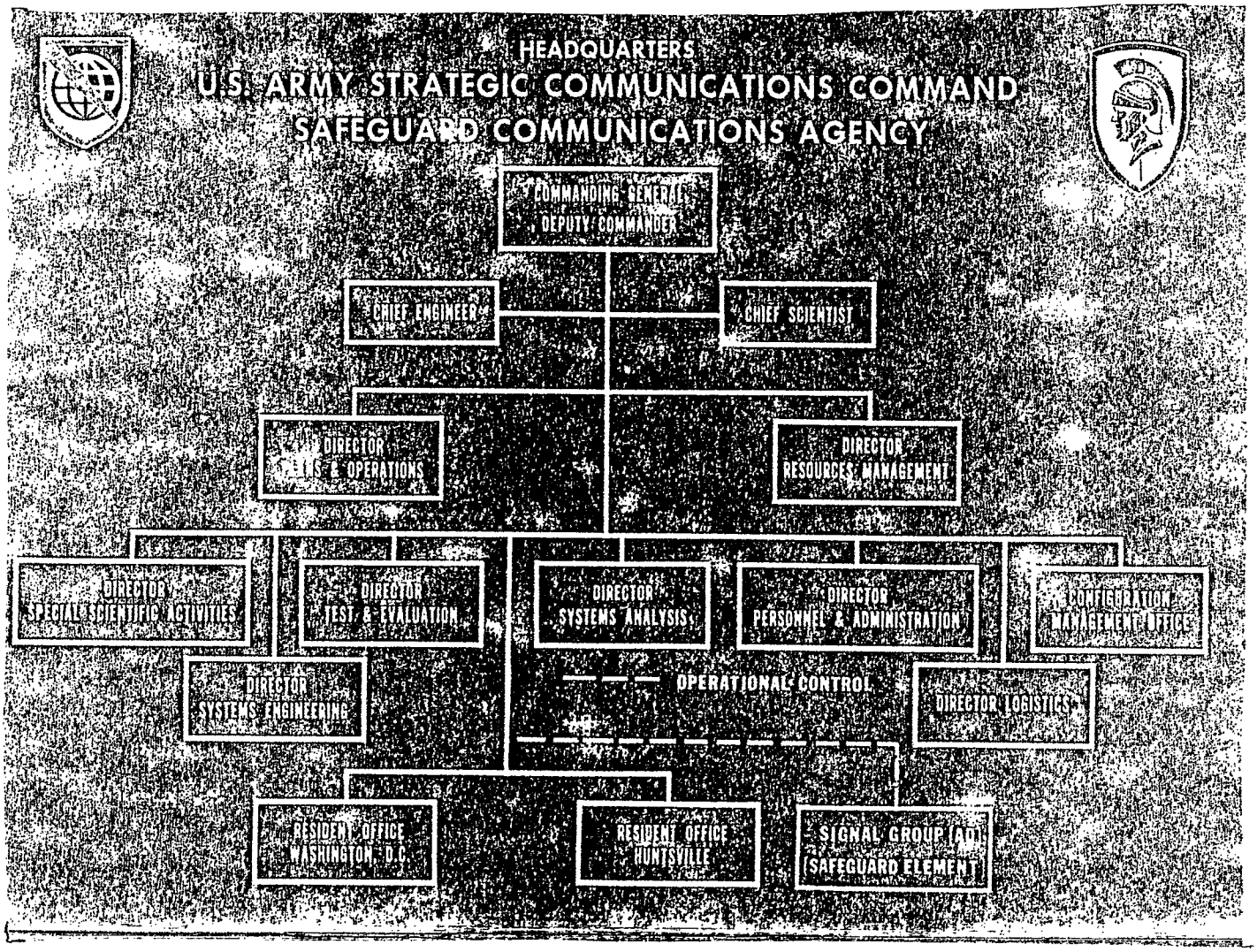
Certain other major Army commands are also specifically involved in Safeguard. One of these is the Army Air Defense Command which has been designated as the ultimate user of the Safeguard weapon system. Another command, U.S. Army Strategic Communications Command, has been tasked to manage the communications

necessary for the Safeguard program. To carry out the responsibility the Commanding General, U.S. Army Strategic Communications Command, has established the Safeguard Communications Agency (SAFCA).

All Safeguard agencies that are directly concerned with design and development of the Safeguard Weapon System are each under the operational control of the Safeguard System Manager.

So much for the background and organization of the overall Safeguard System, now let's examine the communications aspect of Safeguard. SAFCA's mission is twofold: (1) to establish, operate and maintain communications for deployment of Safeguard (management communications) and (2) to consolidate and analyze requirements, provide, and operate Safeguard operational communications (tactical communications). I will discuss each of these later.

To accomplish its mission, SAFCA is organized as shown in figure 1. The U.S. Army Strategic Communications Signal Group (Air Defense) (Fig. 1) has a portion of its organization dedicated to Safeguard. The personnel of this portion of the Signal Group are currently operating the Safeguard Management Communications System, including facilities now under construction in Montana and North Dakota, and will eventually be responsible for operating the tactical communications subsystem for operation of the weapon system.


HEADQUARTERS
U.S. ARMY STRATEGIC COMMUNICATIONS COMMAND
SAFEGUARD COMMUNICATIONS AGENCY
COMMANDING GENERAL
DEPUTY COMMANDER
CHIEF ENGINEER
CHIEF SCIENTIST
DIRECTOR
OPERATIONS
DIRECTOR
RESOURCES MANAGEMENT
DIRECTOR
SPECIAL SCIENTIFIC ACTIVITIES
DIRECTOR
TEST & EVALUATION
DIRECTOR
SYSTEMS ANALYSIS
DIRECTOR
PERSONNEL & ADMINISTRATION
CONFIGURATION
MANAGEMENT OFFICE
DIRECTOR
SYSTEMS ENGINEERING
OPERATIONAL CONTROL
DIRECTOR
LOGISTICS
RESIDENT OFFICE
WASHINGTON, D.C.
RESIDENT OFFICE
HUNTSVILLE
SIGNAL GROUP (ADJ)
(SAFEGUARD ELEMENT)

The commanding officer of the Signal Group Air Defense is in a rather unique position and wears four hats. He is under the command of the CG, U.S. Army Strategic Communications Command, under the operational control of CG, U.S. Army Air Defense Command for the Air Defense Communications, under the operational control of CG, SAFCA for Safeguard communications matters, and he is the Deputy Chief of Staff, Communications-Electronics for Commanding General, Air Defense Command.

Some specific SAFCA tasks are:

(1) Consolidate and analyze communications requirements in terms of overall weapon system effectiveness.

(2) Design, engineer, install, test and operate Safeguard communications.

(3) Provide special personnel training requirements and conduct on-site training.

(4) Define construction requirements.

(5) Provide communications security equipment and support.

(6) Recommend and conduct appropriate Safeguard communications studies.

(7) Establish and train operation and maintenance units.

(8) Participate in weapon system site selection activities.

One of the above tasks is unique in that SAFCA is charged with the responsibility to review and analyze communications requirements. Under usual circumstances the user establishes the communications requirements, and it is the job of the Signal organization to take whatever action necessary to satisfy them. In Safeguard, however, this is not the case. SAFCA reviews, analyzes, and must be in a position to defend communications requirements in relation to overall weapon system effectiveness. Where appropriate for technical, financial, operational or maintenance reasons, SAFCA recommends changes to requirements initiated by the user or weapon system contractor. In case satisfactory resolution is not obtained with the initiator of the requirements, SAFCA recommends decision action to the Safeguard System Manager. (One requirements review and recommendation to the Safeguard System Manager regarding hardened communications cable routes resulted in money savings of more than $10 million dollars.) This task is one of the major reasons for the System analysis effort within SAFCA (Fig. 1).

To facilitate the accomplishment of the analysis task, SAFCA has developed a general event oriented computer simulation model of Safeguard with emphasis on communications. This model, for communications sytems analysis, is SAFCA's principal analytic tool. SAFCA has also developed a companion subordinate model for

circular error probability/collateral damage effects in order to address the specific problem of communications survivability within the minuteman missile fields.

In order to satisfy Safeguard tactical communications requirements, SAFCA is faced with several unique requirements. SAFCA must connect the computers located at the various locations with secure, on-line, real-time communications, using relatively high bit rates. (Note: security requirements, reliability and bit rates are classified Secret and may be obtained from SAFCA) These communications must be highly reliable because the weapon system effectiveness is directly related to communications. Also, communications located in the weapon system complex and in the vicinity of Minuteman Intercontinental Ballistic Missile (ICBM) fields must survive and successfully operate during a nuclear attack. Therefore, communications must be designed to survive in the same environment as other weapon system components such as radar antennas, missile silos and weapon system buildings.

The major communications needs for the currently approved Safeguard deployment are connections between the Cheyenne Mountain complex, Colorado, and the weapon system complexes in the vicinity of Malmstrom, Grand Forks and Whiteman AFB's and the communications between the Missile Site Radars, the PAR's and the RSL's of

each MSR. Also the PAR's at the Grand Forks and Malmstrom sites must be interconnected and both these radars must be connected with the Whiteman AFB site.

A single weapon system complex, such as those at Grand Forks and Malmstrom consists of a PAR, a Missile Site Radar and four RSL's, all deployed in minuteman fields. The Whiteman AFB and Warren AFB complexes are the same except they do not have a Perimeter Acquisition Radar. As many as possible of the communications requirements will be met through existing commercial long-haul national communications sytems. In the minuteman fields, however, it is necessary to provide newly constructed facilities, that will operate before, during, and after a nuclear attack, because: (1) the area does not have sufficient wideband communications for the Safeguard system data requirements, and (2) these routes must go through the minuteman fields and, therefore, to protect the communications against collateral damage from attack on Minuteman ICBM sites, it must be designed against nuclear effects.

Defense Communications Systems, AUTOVON and AUTODIN, will be used to furnish voice and record capabilities for Safeguard.

The readiness date for the Grand Forks complex is 1 October 1974 and for Malmstrom is 1 May 1975. The service dates for the individual links, however, precede these readiness dates by as much

as sixteen months for some links. Two links, for example, in the Grand Forks Complex are required for checkout and test of weapon system components by 1 May 1973.

Regarding the Safeguard requirement for management communications, SAFCA is currently furnishing communications for the Safeguard System Manager, government agencies, and contractors during the current preoperational deployment phase. These communications include voice, digital data, teletypewriter, and facsimile facilities at various locations throughout the Continental United States.

In satisfying the requirement for tactical communications, SAFCA has divided this requirement into two parts, intersite and intrasite. The original SAFCA concept to furnish the intersite portion of the Safeguard communications subsystem was to obtain an interstate communications common carrier to act as the single manager for the government and accept responsibility for the design, engineering, installation, test, operation, and maintenance of the system. An attempt was made to implement this concept but was unsuccessful due to the unwillingness of the communications common carriers to take over responsibility for the complete requirement. It is now recognized that the Government (SAFCA) will manage and be responsible for the entire Safeguard communications system.

Two courses of action are available to the government to satisfy

the Safeguard communications requirements: (1) either lease the system from the various communications carriers, or (2) install a government owned system. There are obvious advantages and disadvantages for both courses, but the lease approach appears to be more attractive politically. SAFCA is currently proceeding on the lease course and is currently designing the intersite portion of the communications subsystem.

As far as the intrasite portion of the communication subsystem is concerned, SAFCA plans to lease it also. The details of the manner in which this will be done have not yet been decided, but once the design of the intersite portion of the subsystem is completed, the details relative to furnishing the intrasite portion are expected to become much clearer.

In summary, we have considered how the Safeguard program evolved to its present status. We have examined the Safeguard organization and deployment, and we have defined its major subsystems. These are radars, missiles, computers, facilities, and communications. We have discussed the communications subsystem organization and activities currently underway in solving the Safeguard communications problems.

It can be concluded that the survivability and dependability of the Safeguard BMD is directly related to communications and to quote

MG York when he was commanding the XVIII Airborne Corps,

"If you ain't got communications you ain't got nothin."