

ELECTRONIC INTELLIGENCE (ELINT) AT NSA



Cover Photos: From top to bottom, US Air Force advanced ELINT airborne collection platform; early GRAB satellite; Cold War ELINT signals analysis equipment.

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Background

What is Electronic Intelligence (ELINT)? ELINT is information derived primarily from electronic signals that do not contain speech or text (which are considered COMINT).

It is divided into major branches. One branch is Technical ELINT (TechELINT), which describes the signal structure, emission characteristics, modes of operation, emitter functions, and weapons systems associations of such emitters as radars, beacons, jammers, and navigational signals.

A main purpose of TechELINT is to obtain signal parameters which can define the capabilities and the role that the emitter plays in the larger system, such as a ground radar locating aircraft, and thus lead to the design of radar detection, countermeasure, or counterweapons equipment. The overall process, including operation of the countermeasures, is part of electronic warfare.

Another major branch is Operational ELINT (OpELINT), which concentrates on locating specific ELINT targets and determining the operational patterns of the systems. These results are commonly called Electronic Order of Battle (EOB). OpELINT also provides threat assessments, often referred to as “tactical ELINT.” OpELINT intelligence products support military operational planners and tactical military commanders on the battlefield.

A former third major branch of ELINT is the collection, processing, and reporting of foreign telemetry signals intelligence (TELINT). TELINT is technical and intelligence information derived from the intercept, processing, and analysis of foreign telemetry. At one time Telemetry Intelligence was considered a branch of ELINT since TELINT (later to be called FISINT — Foreign Instrumentation Signals Intelligence) activities are closely related to TechELINT procedures and were conducted by all of the Department of Defense (DoD) military departments. TELINT is a critical source of performance information on foreign missiles

and space vehicles while they are being developed and tested. TELINT can also provide much operational information on foreign satellites and space vehicles.

Electronic Intelligence (ELINT) at the National Security Agency (NSA) did not have an easy start. When NSA was formed in 1952, consideration was given to including ELINT as well as COMINT as part of NSA's charter. It is widely believed that Lieutenant General Ralph Canine, USA, Director of NSA at that time, felt that managing the DoD COMINT efforts would be enough of a challenge for NSA. This attitude toward ELINT was shared by the DoD military departments — none wanted NSA to manage ELINT; each department was very content to manage its own interests in ELINT.

Department of Defense ELINT, however, was as much in need of coordination and management as COMINT. In particular, the effort badly needed a cohesive signal analysis and processing effort.



***Lieutenant General Ralph Canine, USA,
first Director of NSA***

The Start of Modern ELINT

ELINT had its start in World War II with the invention and use of radar by the Allies and the Axis. The initial Allied ELINT efforts were started by the British; they are described in the book *The Secret War* by Dr. R. V. Jones. The US Army Air Forces had a keen interest in ELINT since most of the German radars at the time were used to target Allied bombers over Germany, and the air forces wanted to know as much about them as possible — including how to evade, “jam,” or “spoof” the radars.

During WWII the US military departments all used ELINT very effectively against German ground radars and against Japanese airborne, shipborne, and submarine radars. One of the early 1943 Army Air Force ELINT missions was flown by a B-24 over Kiska Island in the Aleutian Islands to electronically map the Japanese radars then on the island. In 1944 large numbers of B-24s were outfitted with ELINT receivers, which were used to guide jamming of the German ground radars in Europe.

Soon after WWII, the USAF in Europe (USAFE) embarked on an aggressive TechELINT and OpELINT program, including establishing a solid and expansive cooperative program with several NATO partners.

In 1952 the US DoD set up the Army-Navy Electronics Evaluation Group (ANEEG) to be housed at the Navy’s Nebraska Avenue Naval Security Station (NSS) — by coincidence the headquarters of NSA at the time — staffed with about thirty people. The ANEEG had only informal coordinating collection powers, but it was both a centralized analysis point for processing and analysis of ELINT intercepts and a focal point for coordination of difficult ELINT analytic problems.

In 1955, as ELINT processing problems grew, ANEEG was redesignated the National Technical Processing Center (NTPC), under the USAF Air Staff, and administratively was designated



Naval Security Station (NSS) at Nebraska Avenue in Washington, DC, home of the NTPC

AFCIN-Z; it was housed in Building 20 at the Naval Security Station in Washington, DC. In addition to Army and Navy participation, the NTPC had key participants from the USAF and from the CIA. CIA at that time was operating the U-2 airborne reconnaissance program, and it led the integration of U-2 data into NTPC signal processing efforts. The U-2 had ELINT signal collection packages as well as photographic sensors.

Direction for NSA to Manage DoD ELINT

Starting in 1954, a number of presidential-level committees recommended that ELINT be brought under NSA's purview. Both the Mark Clark Subcommittee of the Hoover Commission in 1954 and the William O. Baker Committee in 1957 made such a recommendation. Dr. Baker was a major influence in having US ELINT efforts managed by NSA. Strongly backed by President Eisenhower, the Baker Committee's efforts culminated in the issuance of National Security Council Intelligence Directive (NSCID) No. 6, "Communications Intelligence and Electronics Intelligence," in early 1958.



Dr. William O. Baker

NSCID No.6 gave NSA many ELINT powers. Within DoD it was implemented in early 1959 by an updated 1955 DoD Directive S-3115.2 and focused DoD top management review within DDR&E, soon to be headed by Dr. Eugene Fubini, a staunch supporter of ELINT and of having NSA manage DoD ELINT. It gave NSA (with certain exceptions) “operational and technical control” of all US DoD ELINT activities. The directive made it quite clear that the Joint Chiefs of Staff, component commanders, and the military departments and services were to fully support these NSA-managed ELINT activities.

ELINT Management Begins at NSA

One of the first actions taken in response to the DoD ELINT directive in March of 1959 was to incorporate the National Technical Processing Center into the NSA Collection and Signal Analysis (COSA) organization as the “Non-communications Signals Analysis and Processing Division.” By 1959, NTPC had about 100 people. This signal processing and analysis group formed the core of the NSA effort at that time.

Some of the DoD military departments and combat commands were not greatly enthusiastic about NSA’s new responsibilities, and as a result many management problems and effective coordination procedures developed. The Strategic Air Command (SAC) was long accustomed to doing ELINT business “their way,” which was tailored to fulfill their mission. SAC soon developed a productive and cooperative set of arrangements with NSA.



NSA Fort Meade complex in the 1960s

SAC had an extremely active ELINT program using RB-47 aircraft (the reconnaissance version of the B-47 bomber) to probe Soviet aircraft defenses in order to get information to protect SAC's fleet of B-52 bombers. All of the SAC B-52s were soon protected with "radar warning receivers" based on ELINT information.

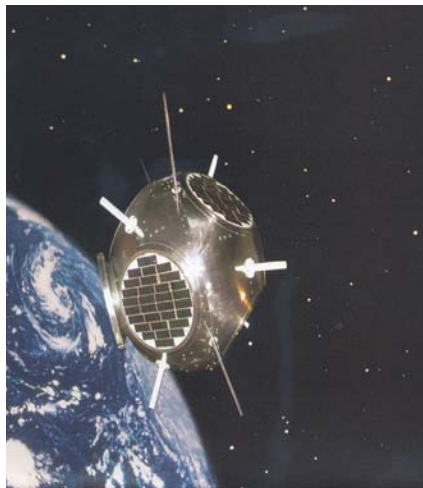
In 1960, two major overseas ELINT processing centers became integral parts of the overall DoD ELINT structure NSA developed. These centers processed and analyzed data primarily from the US military departments' ELINT collection assets. In 1974 the USAF Europe sponsored programs with NATO partners and was fully integrated into the NSA system. Later this effort was combined with the NSA engineering support office in Europe.



Now-closed STONEHOUSE deep space TELINT facility

NSA built and deployed — or sponsored — many ELINT and TELINT signal collection systems during the 1960s. A ring of sophisticated systems was developed and deployed in the TELINT area to gather information on the missile development and space activities of the Soviet Union.

Since the early 1960s, NSA had been a participant in the NRO and US Navy-led GRAB and POPPY efforts to collect ELINT on Soviet air defense radar signals from an orbiting satellite. Intelligence from GRAB and POPPY provided the location and capabilities of Soviet radar sites and ocean surveillance information to the US Navy and for use by the USAF. This effort provided significant ELINT support to US forces throughout the war in Vietnam.



Early GRAB satellite for ELINT signal collection from ground radars

One of NSA's new responsibilities was to prepare a National ELINT Plan (NEP) in coordination with the ELINT community at that time. The first plan was completed in 1963

under NSA leadership with the participation of the US military departments, the Joint Chiefs of Staff (JCS), DIA, and CIA. Several plans followed.

Another response by NSA related to the expansion of NSA ELINT responsibilities was the creation in 1967 of a special group called DAGER, the Director's Advisory Group on ELINT and Reconnaissance. It was a small group headed by Mr. Charles Tevis, who originated the idea and was a strong proponent and technical leader of NSA's stewardship of ELINT.

In the late 1960s during the Vietnam War, ELINT played a major role: many military airplanes were outfitted with warning receivers and jamming equipment to counter the North Vietnamese anti-aircraft guns and surface-to-air missile sites provided to North Vietnam by the Soviets. This radar warning and associated jamming equipment significantly reduced US aircraft losses. One of the key aircraft used was the Navy A-3 SKYWARRIOR, which could be aircraft-carrier-based. When configured for electronic warfare, it was designated EA-3B.



EA-3B ELINT and electronic warfare aircraft

The EA-3B was particularly effective against the Soviet-built SA-2 surface-to-air missile systems which targeted US fighters and bombers over North Vietnam.

The EA-3Bs remained in service until the early 1990s and served around the world as ELINT and electronic warfare aircraft; they were based on land and on carriers. The aircraft were used in the 1991 Gulf War and helped target Iraqi anti-aircraft missile systems for allied air-to-ground missile destruction.

In the early 1970s a joint National Reconnaissance Organization (NRO) and NSA field ELINT processing center was opened. This joint effort added NSA's expertise in signal processing



SA-2 “Guideline” ground-to-air missile system

and its reporting responsibilities to NRO activities, provided many collection and processing advantages, and improved timely reporting of NRO collection results.

Expansion of NSA ELINT Responsibilities

In 1971 the Collection and Signals Analysis organization, elements of the Research and Development organization, and other SIGINT operational elements merged to form the “Electronic Intelligence and Systems Management Group.” This group provided a good institutional base for NSA to manage ELINT, including collection activities and the development of new collection and processing systems for ELINT efforts. Similarly, it created a cohesive way to develop the ELINT portion of the Combined Cryptologic Program (CCP) program and budgets with the DoD military departments. One of the offices in the group concentrated on TechELINT, one on OpELINT, and one on TELINT.

TELINT attained its status as a separate “INT” in 1971 with the publication of the revised DoD Directive 5100.20, which gave NSA its updated charter. TELINT activities were focused in the NSA organization as the Advanced Weapons and Space Systems Office within the new group.

By the early 1970s NSA had completed a network of ground-based foreign telemetry collection facilities and worked with the

DoD military departments and services to develop aircraft and shipborne TELINT signal collection facilities.

National Security Council Intelligence Directive No.6 was updated in 1972 and retitled “Signals Intelligence (SIGINT).” This directive gave NSA even more ELINT powers. Based on NSCID 6 concepts, SIGINT within DoD had been implemented by Department of Defense Directive 5100.20, issued in 1971 and commonly referred to as the “NSA Charter.” The DoD Directive charged NSA with the responsibility of managing SIGINT within DoD and specifically defined SIGINT as including COMINT, ELINT, and TELINT. As previously mentioned, the term TELINT has fallen into disuse and has been replaced by the term FISINT, which includes telemetry, missile and satellite command signals, and beacons.



TELINT signal collection position in early 1970s

During the Cold War years, NSA continued to sponsor — or participate with the DoD military departments, the National Reconnaissance Office, and the CIA in — the development of sophisticated signal collection equipment for target signals to keep pace with the ever-changing technology of those signals.

One of the premier ELINT data collection platforms is a modified US Air Force RC-135U aircraft. The primary function of these



Now-closed 1970s missile and space TELINT facility

TechELINT specially configured aircraft is ELINT reconnaissance and surveillance. They collect, analyze, and sometimes locate foreign target electronic signals to help determine detailed operating characteristics and capabilities. They have been in operation, with a continuing series of advanced configurations, since 1964.



Modified RC-135U advanced ELINT airborne collection platform

Another long-time ELINT collection platform is the US Army GUARDRAIL aircraft. This aircraft is configured to locate enemy fire control radars and thus provide OpELINT. The aircraft can fly near or over a battlefield and communicate directly with Army and Air Force units. The GUARDRAIL collection and related analysis and reporting efforts have served in conflicts starting with the Vietnam War through DESERT STORM in 1991.

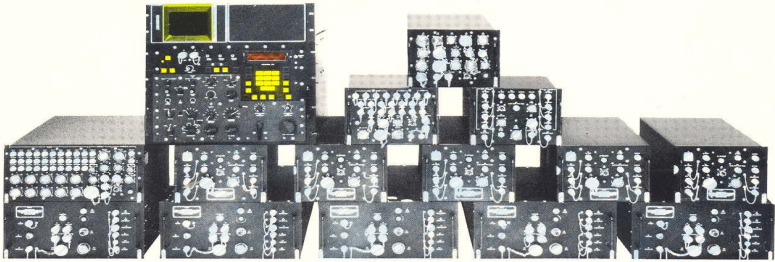


RC12 GUARDRAIL COMINT and ELINT collection platform

During the Cold War many technological advances were made in ELINT collection and analysis equipment. These advances made increased capabilities possible with more reliable configurations and by consuming less electrical power. As the “state-of-the-art” of foreign radar and other electronic equipment advanced, ELINT receivers had to keep pace. One such receiver, developed in the 1970s for both ground site and airborne use, was the QRC-259. Some thirty to forty receiver systems were deployed and operated into the 1990s.

NSA also continued to modernize and expand its ELINT signals processing and analysis equipment “positions.” The Agency likewise upgraded positions at selected field facilities with emphasis on more timely reporting of ELINT results.

NSA also developed and operated special-purpose telemetry processing equipment, often computer-based, in the National Telemetry Processing Center (using the abbreviation NTPC).



QRC-259 ELINT signal receiver developed in the 1970s

Different types of equipment sets were needed to process and analyze different forms of telemetry used by various telemetry transmission equipment. One example is RISSMAN, a special-purpose telemetry processing system used at NSA during the Cold War.



RISSMAN, a special-purpose telemetry processor



Cold War ELINT signals analysis equipment set operated at NSA

Summary

Starting in 1958, and working with other US and allied ELINT organizations, NSA technical and management initiatives and expertise have made significant intelligence gains for the United States and its allies. These gains provided vital intelligence information for use by electronic warfare equipment designers and operating personnel. They also provided critical information on foreign missiles and space vehicles that were a threat to the United States. NSA continues today in its role as the lead US organization for ELINT matters.

About the Author

Richard Bernard is a consultant and volunteer in the NSA Center for Cryptologic History (CCH). He has held a number of ELINT planning, engineering, and operational positions at NSA. He has been a member of the Association of Old Crows, an electronic warfare technical association, since 1979.