Entering The New Millenium
Leveraging Information Technology
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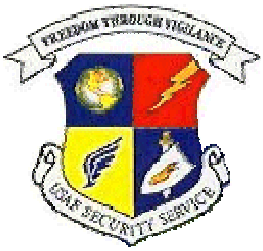

USAF Security Service

Fifty years ago, the United States Air Force Security Service found itself in a precarious situation. In 1949, four years after the end of World War II, both the nation and its national security institutions faced the daunting task of dealing with a perceived rapidly emerging military threat from the Soviet Union.

In examining the courses the capitalist western and communist eastern blocs embarked on in the immediate post World War II years one point became totally clear. Western bloc nations chose to develop robust economies accompanied by a united organization of adequate military forcesNATO led by the United States. NATO faced an eastern bloc of Soviet Satellite nations with centrally controlled economies. Moreover, the eastern bloc was totally obsessed with maintaining a huge military led by the Warsaw Pact and dominated by the Soviet Union. With the Cold War in full bloom and the Second World War now a past

experience, the United States and its NATO allies faced the new challenge of countering the military threat posed by the Soviet Union and its alliance of satellite nations.

USAFSS: Early technology

USAFSS as an organization had to rely on army assets to get started. The new command established on Oct. 20, 1948, had two important functions to carry out a cryptologic mission and provide COMSEC for a fledgling Air Force.

Following three months of negotiations with the Army Security Agency, USAFSS gained its first subordinate units on Feb. 1, 1949, with the transfer to the command of the 1st Radio Squadron Mobile in Japan, the 2nd RSM in Germany, the 8th RSM at Vint Hill Farms, Va., and the 136th Radio Security Detachment at Fort Slocum, N.Y.

As an integral part of the newly established independent air arm of the United States, USAFSS was charged with processing and reporting special intelligence information. The problem in dealing with the Soviet Union became clear when America's leaders realized how important establishing and keeping intelligence organizations intact would be to the national security future of the United States. Clearly, the cryptographic successes of MAGIC (the decoding effort against the Japanese) for the United States and Enigma (the German encoding device exploited by Great Britain) for the United Kingdom during World War II showed the clear need for advanced computer technology in the intelligence area during the Cold War.

From a technological standpoint, the units that comprised USAFSS in its infancy used state-of-the-art equipment to accomplish their missions. The pre-transistor period prior to 1947 saw the use of antennae and radio receivers, which utilized old bulky "vacuum tube" technology. In fact, by the early 1940s it became clear the usefulness and practicability of vacuum tubes were short-lived. The massive wartime cryptologic efforts of the British Ultra Project created Robinson, the world's first operational computer and the later electronic version called Colossus (built using 2,000 radio vacuum tubes.) The latter signaled a need to develop a circuit that took up less space, emitted less heat and had better reliability. In this area, the already relatively "old" radio technology that matured in the early part of the 20th Century was now quickly becoming inadequate and limited the capability of the first electro-relay-based computers to perform cryptographic equations. Nonetheless, World War II saw important improvements in technology. Specifically, the M-209 converter, used by the

United States quickly processed vast amounts of cryptologic material.

1940's: 1950's:

Early efforts to create tactical intelligence support, transistor invention In its first year as an organization, USAFSS took steps to ensure it could provide tactical intelligence support for the Air Force. A joint chiefs of staff document, 2010/6 published in July 1949 assigned responsibility for intelligence processing to the individual services "as needed for combat intelligence." By the spring of 1950, USAFSS had secured approval by the Office of the Secretary of Defense and Air Force Vice Chief of Staff of its tactical area intelligence production plan.

Destined to play a major role in shaping both tactical and strategic intelligence was the occurrence of a single event in the late 1940s that set the stage for the exponential expansion of information technology during the last half of this century. In 1947 three engineers at Bell Laboratory invented the transistor. The transistor revolutionized microelectronics, later leading to the development of mainframe and minicomputers. It is now clearly obvious that the invention of the transistor, integrated circuitry and advanced integrated micro-circuitry have been the catalysts driving the unprecedented proliferation of information technology sweeping most of the globe since the early part of the 1990s. Not surprisingly, the invention of the integrated circuit in 1958 ushered in another quantum leap in computing power with the invention of the Control Data Corporation 1604, the world's first fully transistorized supercomputer by Seymour Cray. Indeed, the then super-secret National Security Agency began to utilize this technology during the late 1950s for its most difficult cryptologic efforts. By this time, USAFSS units at groundsites in places like Chicksands, England; Misawa, Japan; San Vito, Italy; Karamursel, Turkey; Peshawar, Pakistan; Shu Lin Kou, Taiwan; and others furnished much of the raw intelligence for NSA's Crays.

1960's: Vietnam, Combat Support and Technology

The pace of technology during the 1960s moved quickly. President Kennedy's challenge to the American scientific community in 1961, in a speech before a joint session of congress to land a man on the moon "before the decade is out" inspired important research in computer science. Clearly, the navigational flight computers that flew aboard the Apollo Command and Lunar Modules each possessing 240K of Random Access Memory stood as computer technology wonders of the world at the end of 1960s.

On the military side, the United States was slowly but inexorably being drawn into the Vietnam conflict as the 1960s reached its mid-point. In early 1962, USAFSS deployed its first Emergency Reaction Unit to Southeast Asia. Later that year, USAFSS began providing a cryptologic capability from Thailand in support of U.S. operations in the Pacific. Not confined to the U.S. space program, the best computer technology also found its way into the most advanced U.S. weapons systems as integrated circuit technology debuted aboard a flight test of the Minuteman III Intercontinental Ballistic Missile in 1968.

AIA's predecessor organization, USAFSS, acting in concert with other DOD agencies, used modern technology to exploit intelligence information via airborne platforms during this time. In 1962, USAFSS crews began flying RC-135 missions in the Arctic region. By 1964, USAFSS EC-47 and RC-130 aircraft began full-fledged airborne reconnaissance operations in Southeast Asia. Three years later, USAFSS took on the task as the central evaluating agency for U.S. air force electronic warfare activities. The new role for USAFSS marked the first major change in the command's mission since its inception two decades earlier. Transistors now allowed large mainframe computer to make significant differences in the large intelligence picture. New technology also allowed the introduction of systems like SRAWHAT and TEBO at USAFSS groundsites, further automating many labor-intensive field operations.

1970's: Technology: Use of commercial components

During the 1970s, AIA's predecessor organization, USAFSS found itself applying technology that would later set the framework for providing all-source intelligence support to the warfighter. The introduction of the simple integrated circuit, later to foreshadow even more significant technological breakthroughs dominated military operations. Within USAFSS, in the aftermath of the Vietnam War, the command began to take on new missions, playing a central role in the Air Force's rapidly expanding electronic warfare mission. In this area, USAFSS established the Air Force Special Communications Security Center to execute the Air Force communications security mission assigned to the command. Modern remote collection operations began in earnest in 1976 when the 6903rd Security Squadron (now the 303rd Intelligence Squadron) began operations in support of the U-2 Olympic Game mission.

USAFSS' application of technology during the 1970s set the stage for the later application of all-source intelligence support to the warfighter. The redesignation of the Air Force Special Communications Center as the Air Force Electronic Warfare Center July 1, 1975, positioned

USAFSS as the central player in the Air Force's rapidly expanding electronic warfare mission.

Outside the military, American Companies began developing information technology that is taken for granted in the late 1990s. Around 1970, at same time the first floppy disks were introduced for data storage, researchers at the Xerox Palo Alto Research Center developed Alto, the first personal computer. Alto pioneered the use of bitmapped graphics, windows (sound familiar) icons, and the ubiquitous pointing device known as the mouse. In 1971, Intel, established in 1968, introduced its first microprocessor, the 4004. In this fast expanding area, Moore's law, postulated by Intel cofounder and coinventor of the integrated circuit Gordon Moore in 1965, began to take shape. Moore reasoned that the available area in which to pack transistors on an integrated circuit would double every two years. In 1972, Intel's most sophisticated computer chip contained 3,500 transistors. In 1974, chips in the 8 bit Intel 8080, the first general-purpose microprocessor contained 6,000 transistors. By 1978, Intel's newest chip contained 29,000 transistors. Probably just as important was the computer networking research that later lead to the development of the internet taking place at UCLA, the Advanced Research Programs Agency, Lincoln Laboratories, the Stanford Research Institute and other institutions. Two high school pals, Bill Gates and Paul Allen started a then little known software company called Microsoft in 1975, one year before Steve Jobs and Steve Wozniak assembled the first Apple computer in the Job's family garage. Indeed by 1979, it was becoming clear that computers needed connectivity to be totally effective when Dennis Hayes shipped the first PC modem.

As events played between NATO and Warsaw Pact in the now 30-year-old Cold War, another fact became totally clearthe superior quality of technology available to the western bloc. In illustrating this point one has to look no further than the vacuum radio tube technology and pop rivet airframe technology western intelligence analysts discovered on the MiG-25 Foxbat Lt. Victor Belenko defected to Japan in September 1976.

USAF Electronic Security Command

By the end of the decade, with USAFSS now playing an expanded EW role, the command was redesignated the Electronic Security Command Aug. 1, 1979.

1980's: Modern computers, fall of Berlin Wall

As the 1980s began, growing defense budgets allowed ESC to capitalize on several technological breakthroughs realized during the decade. These breakthroughs allowed ESC to begin to focus its attention on furnishing vital all-source intelligence support to warfighters and theater commanders.

Command operations reaped the benefit of the capabilities of modern computer microprocessor based systems using 8088 and 286 based processor technology. The introduction of the Conventional Signals Upgrade and other systems profoundly changed the mechanics of ESC's intelligence operations. Without a doubt, the 1980s heralded the arrival of the information age.

During this time, command personnel furnished EW and C3CM support and provided senior battle commanders with analytical reports on major exercises and EW system effectiveness throughout the world. In the 1980s ESC provided invaluable support to several significant military operations and contingencies including Urgent Fury, El Dorado Canyon and Just Cause. ESC began its venture into the realm of space operations during this decade. In 1986 the command activated Headquarters Space Electronic Security Division at Peterson AFB, Colo. Just as the 1970s witnessed the maturation of several important information technologies, the 1980s began in a similar vein. Desktop publishing hit the market in 1981 with the introduction of Xerox's star computer and the personal computer by IBM. In 1984, Apple introduced bit-mapped graphics, icons and the mouse in its Macintosh, foreshadowing a PC boom that would begin in the next decade. That same year, Cisco Systems developed the first high-capacity commercial routers, which enabled large amounts of data to be passed over and between computer networks. Also in 1984, by strange coincidence, the term

"Cyberspace" first appeared in William Gibson's book Neuromancer.

By the middle of the decade the Apple laserwriter printer provided writers and artists an inexpensive means to produce finished documents. Also, by this time, integrated micro-circuitry enabled compact disc players and cordless phones to become commonplace in the home and the fax machine, a technology invented in the mid-1800s, introduced in Japan in 1950s, proliferated in the business-place.

Undoubtedly, the most significant development during the decade occurred in the relationship between the eastern and western blocs. By the end of the decade, the geo-political landscape of the globe changed in a manner few would have thought possible in previous years. Perestroika flourished in the Soviet Union and provided the impetus for the Soviet people to question openly their system of government as communism began to wane. Suddenly on Nov. 9, 1989, the wall separating East and West Berlin was literally knocked down by freedom-loving East Germans who had lived for more than two generations under a Soviet-sponsored totalitarian system of government.

In short order, many other Soviet satellite states in Eastern Europe quickly wilted. Communism, however, did not exit peacefully everywhere, as a violent revolution gripped Romania and saw its tyrannical leader, Nicolae Ceausescu forcibly deposed.

1990's: Unprecedented changes in post Cold War world, explosion of information technology

Clearly the 1990s have been a decade of heretofore unseen changes. The dissolution of the Soviet Union and communism in December 1991 essentially set the stage for the information revolution now proliferating the world. Technology itself played a key role in helping to topple the Soviet Union with the introduction of photocopiers and fax machines in the centrally controlled economy. These seemingly simple machines allowed for the reproduction of literature critical of the Soviet system. Earlier in 1991, Desert Storm served as a harbinger of future wars as U.S. - led coalition forces achieved a high degree of information superiority knocking out Iraq's command and control network. ESC units served at the forefront during Desert Storm. People from several command organizations played essential roles in helping to achieve the coalition's information dominance in the conflict.

By the end of Desert Storm, key commanders knew the importance microprocessor computer based systems like the Tactical Information Broadcast Service and Constant Source brought to the warfighter. As quickly as Desert Storm unfolded, ushering in the age of

Information Warfare, the collapse of the Soviet Union signaled the need to restructure Air Force intelligence. Truly, after 1991, the bi-polar security landscape of the Cold War gave way to a global economy oriented multi-polar world.

USAF Air Force Intelligence Command

Within the newly emerging multi-polar world ESC became the Air Force Intelligence Command Oct. 1, 1991. The new organization, with a charter of becoming a truly all-source intelligence command, formed by merging the personnel and missions of the Air Force Foreign Technology Division and elements of the Air Force Intelligence Agency into a single command. Several events in the early and mid 1990s literally led to a wired world. The development of hypertext markup language in 1990, and later hypertext transfer protocol released by the CERN Laboratory in Geneva led to the conception of the worldwide web. Indeed, by 1994 the worldwide web had emerged prominently, with one well-known U.S. internet service provider serving 1 million customers and the number of internet hosts passing the 10 million mark.

Vint Cerf, known as the father of the internet and co-inventor of transfer connect protocol and internet protocol pointed out in 1997 that at the end of the 20th Century the Internet was roughly the same age as the telephone was at the end of the 19th Century. The exponential expansion of information technology in the second half of the 1990s has become wholly apparent with we now live in a wired world.

Just as the Internet and World Wide Web have transformed society in almost every facet, its resultant influences have profoundly changed the way future wars will be fought.

USAF Air Intelligence Agency

The redesignation of AFIC as the Air Intelligence Agency, a field operating agency, Oct. 1, 1993, came about because of the need to restructure to an objective Air Force. Emphasizing increased support to the warfighter, AIA wasted no time moving to exploit the fast developing information technologies of the 1990s.

Today at the dawn of the new millennium, AIA plays a central role in not only helping the U.S. Air Force achieve information superiority in support of aerospace operations, but also assists all U.S. armed forces shape the battlespace picture. As NSA, AIA's service cryptologic overseer, now deals with new ways of exploiting modern information technology, it is not an understatement to say the Agency will always have a key role to play in future conflicts as its embeds its forces within the numbered air forces.

In the year 2000, nearly all actions will depend on some aspect of the communications infrastructures. In the area of information operations, AIA is now moving to place itself in a position to fuse information into a coherent picture of any conflict to support combatant commanders. How well AIA is able to gain, exploit, defend and attack information will determine its destiny in the 21st Century.