(U) Chapter 4
The Phasedown (1990s)

(U) Overview

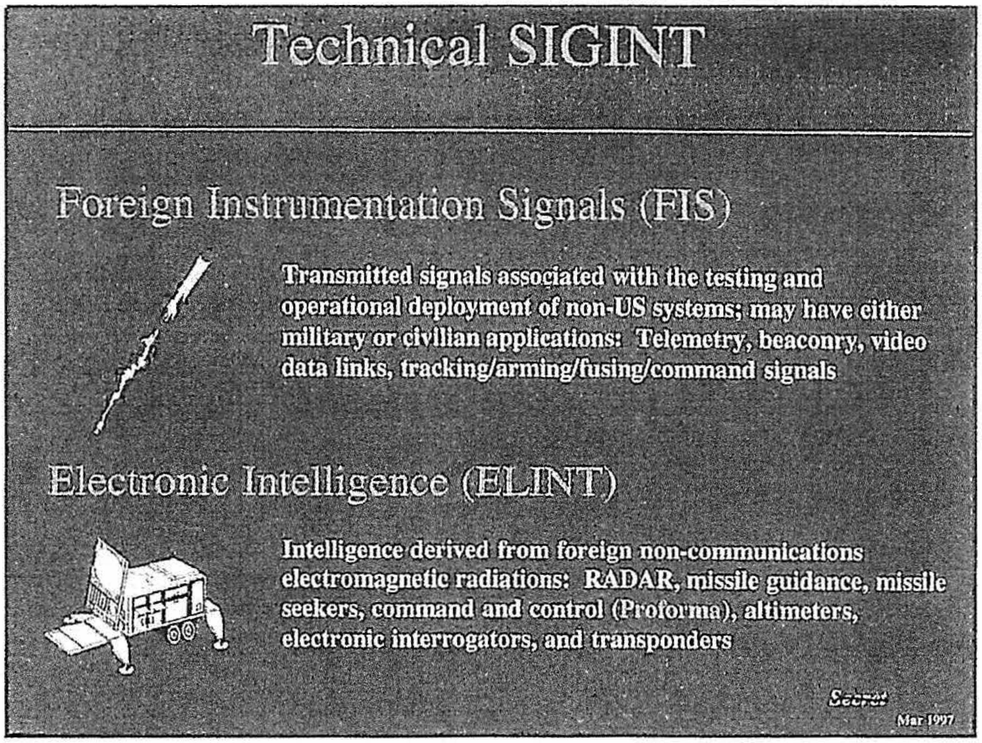
(TS//TK) The 1990s can be characterized by the phrase "declining resources." While the worldwide intelligence target set broadened considerably, the downsizing of the SIGINT system forced the closure of several collection facilities. However, as the priority of the Russian targets diminished in both size and scope, the countries developing and testing their own missile and satellite programs increased dramatically. In 1990 there were almost 240 non-Soviet, non-PRC missiles of the over 2,000 reported on by DEFSMAC. Missile developments by North Korea and Iraq were becoming of high concern. There were ninety-one foreign space launches in 1990, including eight to the MIR Soviet space station. Of those, there were nineteen space launches which placed twenty-six satellites into orbit, including three launches by the PRC.[97] By 1995, the former Soviet Union had reduced its satellite launch rate only from about 120 per year in the mid-1980s to about 80 per year.

(TS//TK) The complex of space-based intelligence collectors that provided intelligence information on foreign missile and space activities did not decline significantly. However, starting in 1993 NSA believed that no more than [redacted] should be used for [redacted] as this was deemed sufficient for the priority Russian and Chinese FIS missile and space targets. The closure of the land-based telemetry collection locations suffered more. The most significant closure was HIPPODROME, a location primarily targeted against Russian missiles from KYMTR and against Soviet/Russian orbiting satellites. Also, the three [redacted] "gap fillers" [redacted] - were closed, as well as the [redacted] These closures further reduced coverage of [redacted]

(TS//SI/TK) The closure of [redacted] reduced coverage of Soviet/Russian [redacted] still operated the [redacted] collection facility (but then closed it in 2001). The [redacted] facility in [redacted] also closed in 2001 and the [redacted] USAF-operated facility closed in 1995. The USAF operated [redacted] facility in [redacted] remained open in the 1990s but closed in 2001. Only the USAF [redacted] site in [redacted] and the [redacted] site in [redacted] remained open after 2002.

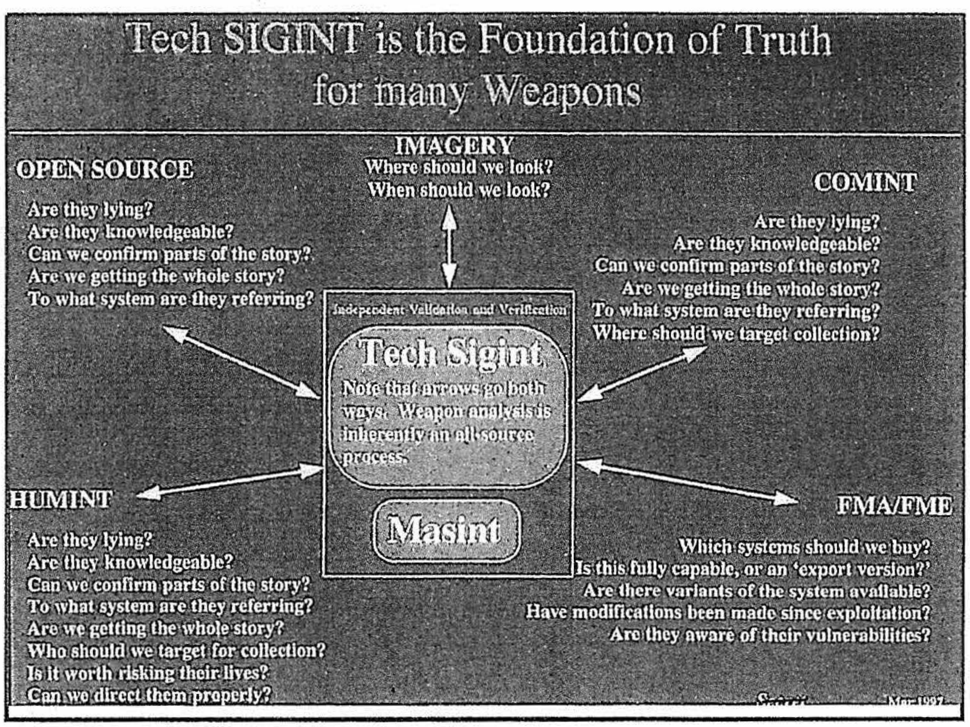
(C) As is often the case during periods of declining resources, several studies were conducted during the 1990s to review the activities of the U.S. FIS community of collectors, processors, and analysts. This was occurring across the board in the "Technical SIGINT" area, a term that had been developed to cover the FISINT, ELINT and PROFORMA areas. One of the most comprehensive was conducted under the umbrella of the Associate Director of Central Intelligence for Military Support (ADCI/MS) in 1997. The review concluded

> ***... that Technical SIGINT is in serious trouble due to resource adjustments and cutbacks. If current deficiencies are not rectified, the results could be disastrous for weapons-related foreign instrumentation signals (FIS)...***[98]



~~(S)~~ Fig. 141. Technical SIGINT

Figure 141 shows the definitions of FIS and ELINT, used by this group, and figure 142 shows the contributions and relationship of Tech SIGINT to the other intelligence disciplines for weapons systems



~~(S)~~ Fig. 142. Tech SIGINT is the foundation of truth for many weapons.

[redacted]

intelligence. [redacted] Other key related studies were done during the 1990s by the Weapons and Space Systems Committee (WASSC) of the United States Intelligence Board (USIB). The WASSC was formed in 1994 by the deputy director of Central Intelligence (DDCI) partially because of the concern about deteriorating U.S. knowledge for worldwide foreign weapons systems. These studies are shown in figure 144. It is significant to note that NSA's FIS analysis and production dollar expenditures dropped from [redacted] (about 50 percent devoted to FIS processing) in 1990 to [redacted] in 1998.

<u>Studies Since 1990</u>

- GDIP REVIEW OF TECHNICAL ELINT PROCESSING AND ANALYSIS (1990)
- FIS REQUIREMENTS AND THEIR SATISFACTION (1992)
- SIRVES EVALUATION OF PROFORMA REQUIREMENTS AND THEIR SATISFACTION (1992)
- REVIEW OF TECHNICAL SIGNALS EXPLOITATION AT S&TI CENTERS AND THE INTERMEDIATE PROCESSING CENTERS (IPCs) (1993)
- WEAPONS-RELATED SIGNALS: IMPROVING A COMMUNITY PROCESS (also called the Lead Team Study) (1993)
- COPING WITH THE ELECTRONIC BATTLEFIELD: A REVIEW OF TECHNICAL ELECTRONIC INTELLIGENCE PRODUCTION PROCESSES (also called the TEST Report) (1996)
- FIS ANALYSIS IN THE US INTELLIGENCE COMMUNITY (also called the INTEC FIS Study) (1996)
- RESPONSIVENESS OF THE USSS TO WEAPONS AND SPACE SIGINT NEEDS (in progress)

~~(C)~~ Fig. 144. Technical SIGINT Studies, 1990 - 1997

PL 86-36/50 USC 3605

[redacted]

(U) The Changing Nature of Foreign Missile and Space Activities

~~(S)~~ While resources were declining, the types and geographic dispersal of worldwide missile and space launch locations were expanding at an enormous rate. DEFSMAC had requirements to monitor and report on the activities of 1.4(c) [redacted] in addition, the long-time interest in Russia, the former Soviet Republics, and the PRC continued. [99] Figure 145 shows a list of foreign countries, other than Russia, that have missile and space facilities. Figure 146 is a map of these worldwide locations, called "Nth" countries for this graphic. The net impact was a much greater geo-

1.4(c)

[redacted]

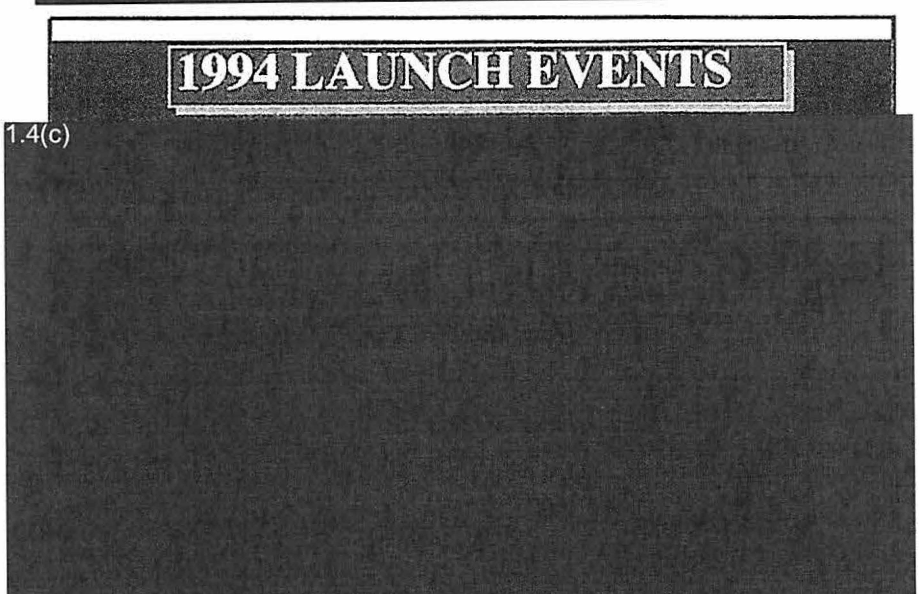
1.4(c)

[redacted]

graphic dispersal of potential intelligence target locations, which makes photographic and signal intercepts (and types of signals) much more complex and difficult. The impact of satellite telemetry collection can be found in the following from a July 1998 WASSC report on weapons telemetry:

So far in 1998, [redacted] percent of TM intercepts have been collected from overhead.

(S) By 1994 Soviet/Russian missile and space activities had declined in quantity as well as in priority. As shown on figure 147, the DEFSMAC "Period-of-Interest" (POI) announcements for non-Russian, non-PRC possible events was almost [redacted] percent of the total, although over [redacted] percent of the actual launches were Russian, which speaks to the reliability of the former Soviet Union program. [redacted]



(S) Fig. 147. 1994 launch events

(U) By the late 1990s, ballistic missile threats to the U.S. came not only from Russia and China, our Cold War adversaries with long-term experience in developing missiles, but from North Korea, Iran, Iraq, India, and Pakistan, all of whom had SCUD-based missile technology provided by Russia or China. This unclassified assessment of the "Rumsfeld Commission" was supplemented by a highly classified report outlining the details which supported their conclusions and added information, including the threat from nations not listed above.[101] Even little Yemen launched eleven short-range SCUD ballistic missiles, one of sixteen countries that launched missiles or satellites in 1994.

(S) Although Former Soviet Union (FSU) satellite launches declined significantly during the late 1990s, the Soviets opened a new satellite launch facility at Svobodnyy, Russia, with the launch of an SL-18 (a launch vehicle based on the SS-25 ICBM and thus subject to the constraints of START-1) and the launching a ZENA navigation satellite in 1997. It is believed that the Russians wanted to reduce their dependence on the Tyuratam Missile and Space Center (TTMSC), which is now in Kazakhstan. (The former name used for this facility during its initial period of activity while it was still in the Soviet Union was Tyuratam Missile Test Range (TTMTR)). The announcement of the new Svobodnyy launch facility was also used by the Russians in political negotiations with Kazakhstan on the future Russian use of the Tyuratam facilities.

(U) The DEFSMAC DESERT SHIELD and DESERT STORM Activities

(S) Starting from a recommendation of USSPACECOM in early 1990, DEFSMAC, NSA and DIA reviewed their relationships.[102] The result was a Memorandum of Agreement (MOA) signed in March 1990 between CINCUSSPACECOM, DIRDIA and DIRNSA which clarified the role of CINCSPACE with regard to DEFSMAC activities and provided for [redacted] The MOA formally identified a crisis/war role for DEFSMAC for the first time.[103]

[redacted] One of the most extensive and significant roles of DEFSMAC in the early 1990s was the support it provided to DESERT STORM and DESERT SHIELD. [redacted] DEFSMAC was able to alert NSA crisis managers who advised U.S. and Allied combat forces of Iraqi SCUD Short Range Ballistic Missile (SRBM) missile launches. The DEFSMAC information was able to give the [redacted] This allowed U.S. and Allied forces to take defensive as well as offensive actions against the SCUD missile. Over fifty CRITICs were initiated based on the DEFSMAC information. Figure 149 shows the overall data flow for the scenario. Figure 150 is the Project [redacted] display in DEFSMAC that provided the information on which the DEFSMAC analyst could make judgments, and figure 151 shows the display of the terminal issuing a CRITIC report on such a SCUD launch. The U.S.-sponsored and [redacted] systems also often provided related or confirming information. General background information was provided by another DEFSMAC analyst support system called [redacted] which plotted known locations of SCUD missiles in Iraq. Figure 152 shows such a display. DEFSMAC later received an award from the NSA deputy director for operations for its DESERT SHIELD-STORM activities.[104]

[redacted]

(~~TS~~) Fig. 149. DEFSMAC intelligence role for DESERT STORM

[redacted]

(~~TS//SI//TK~~) Fig. 150. [redacted] display

[redacted]

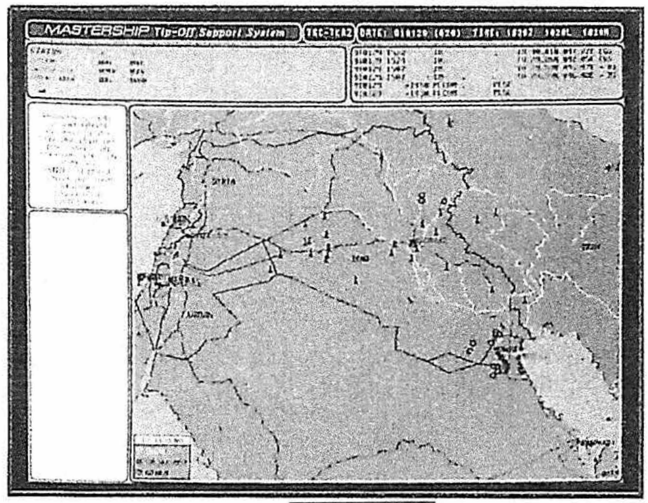
(~~S~~) Fig. 151. Critic report

~~(S)~~ Later, in 1992, the important DEFSMAC role in evaluating foreign missile and space launches was further confirmed by adding DEFSMAC to the [redacted] Missile Event Conference phone network, sponsored by the U.S. DoD National Military Command Center (NMCC). [redacted]

(U) DEFSMAC and Other Management Changes

(U) The 1990s started with [redacted] as director of DEFSMAC, followed by R. Steven Smith (1992-1994), [redacted] (1994-1996), [redacted] (1996-1999), Boyd D. Davis (early 2000), and [redacted] (end of decade).

(U//FOUO) The 1990s started out very well for DEFSMAC. The Center was awarded the National Intelligence Meritorious Unit Citation on December 4, 1990, by the director of Central Intelligence (DCI) for its accomplishments in the late 1980s while [redacted] was the DEFSMAC director. The citation states in part that DEFSMAC



~~(TS)~~ Fig. 152. DEFSMAC [redacted] Support Program

...responded to the challenge of sustained, substantial increases in foreign missile and space activity and demonstrated extraordinary responsiveness in meeting major new operational and Intelligence Community requirements which extended far beyond the tasking in its original charter.

The DEFSMAC management team which led this effort, along with senior NSA managers, is pictured in figure 153.

[redacted]

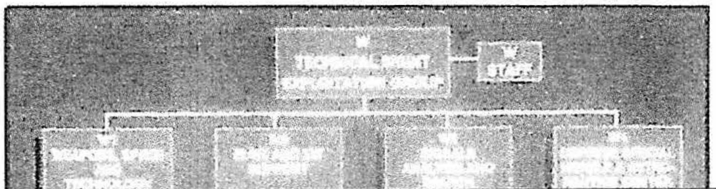
~~(S//SI)~~ While the rest of the world increased its missile and space activity, the demise of the Soviet Union started to have its effect on Soviet/Russian missile and space activity. In particular, the number of SOYUZ manned spacecraft missions to MIR began to decrease. While the Russians still kept MIR almost continuously manned, there was a marked reduction in the number of applied military research experiments carried out by MIR. Starting in January of 1990, the DEFSMAC Manned Space Operations Center (MSOC) reduced its fully staffed operations [redacted] with call-in linguistic support as required. This would be the first reduction of DEFSMAC activities of the decade, but not the last. At this point there were about 115 people directly assigned to the Center from DIA and NSA. While this area was reducing, DEFSMAC and NSA support to the forthcoming START regime on all ICBMs (at least six types) and SLBMs (at least seven types) was adding a workload to DEFSMAC as well as to the W1 NTPC signals processing organization.[105]

~~(C)~~ In early 1990 consideration was given to moving all of Group W, including the W1 Office of Space and Missiles, but not DEFSMAC, to the NSA Friendship Annex complex, called FANX, near the Baltimore Airport. This would have had a severe impact on DEFSMAC/W1 interactions. A study was conducted in early 1990 outlining the ramifications of this move. At the minimum there would have been an $11,000,000 cost to adjust to the DEFSMAC/W1 separation. An additional eight people would also have been required. A useful by-product of the study includes a good description of all of the electronic systems interfaces then existing or planned between W1 and DEFSMAC. (Fortunately for DEFSMAC and W1, the planned Group W move did not materialize.)[106]

~~(S//SI)~~ By the middle of the 1990s, DEFSMAC was still pretty busy. In 1994 Russia successfully launched forty-eight spacecraft. The rest of the world, including the PRC, launched seventeen. There were more than 300 satellites on orbit and under control of foreign entities. By comparison, the U.S. had about 175 satellites on orbit. Foreign targets launched 484 missiles of all types. Russia continued to lead the countries in launching testing and training missiles for a total of over 400 launches. The rest were from sixteen different countries, of the ninety-two countries that own missiles of varying capabilities.[107] In February 1996 Group W once again reorganized, along with the rest of the Operations Directorate, and became The Global Issues and Weapons Systems Group.

~~(C)~~ In March of 1992, there was an NSA Directorate of Operations (DO) restructuring and the NSA element of DEFSMAC, which had been administratively assigned to W11, the Operations Division of the W1 Office of Space and Missiles since the early 1970s, became W41. The director of DEFSMAC, [redacted] at the time, became the chief of W4. This gave DEFSMAC administrative responsibility for all of the NSA people directly assigned to DEFSMAC, as well as the administrative workload that accompanied such a change. The primary reason for the DO restructuring was to form a new Group called "Z" responsible for cryptanalysis and cryptanalytic processing throughout the DO. The name of W Group was changed to "Technical SIGINT and Exploitation." The major changes affecting FIS were (1) the formation of W4 which moved the NSA personnel assigned to DEFSMAC from W1 to W4; and (2) the creation of the National Weapons Signals Processing Center, which consolidated FIS, ELINT and PROFORMA processing activities into one organization. [redacted] was its first chief.[108] Figure 154 shows the revised W Group structure.

~~(S)~~ Also in 1992 a DoD Inspector General report on NSA raised the issue of the lack of definitive DoD guidance on how NSA and DIA should share manning and budgeting responsibilities. (A DIRDIA and DIRNSA Memorandum of Understanding in May of 1964 had established the general guidelines.) A representative of the assistant secretary of defense for C3I reviewed the topic with NSA, DEF-



[redacted]

(U//FOUO)Fig. 154. W Group personnel structure

SMAC and DIA managers, and no changes were made.[109]

~~(C)~~ By the middle of 1993, there was intense pressure to reduce funding and personnel expenditures within the intelligence community. DEFSMAC was not excepted from this scrutiny. A review was conducted by W Group and included W4/DEFSMAC. A considered response indicated that while some functions could possibly be moved from DEFSMAC to other NSA organizations, there was only a possible net reduction in personnel strength by three staff position from an authorization of [redacted] people. The ongoing O&M funding requirements for computer rental and software licenses of about [redacted] a year and the procurement funding of less than [redacted] per year could not be reduced. The R&D funding of about [redacted] over five years for DEFSMAC modernization (primarily [redacted] was felt to be minimally funded at that level.

~~(S)~~ In late 1993 DEFSMAC and the U.S. Space Command Combined Intelligence Center (SCJ2F) undertook a detailed review of their missions, functions, and interfaces in order to identify adjustments to streamline operations of the two organizations. The in-depth review by the joint team revealed complex and divergent missions, driven by different customer requirements and a general void of duplicity.[110] The review only enhanced the relationships between DEFSMAC and SCJ2F.

~~(S)~~ Also in late 1993 consideration was given by the deputy director of Central Intelligence (ADM William O. Studeman, USN) to making DEFSMAC the core of an interagency DCI "center" similar to the DCI's Counterterrorist Center, the Counternarcotics Center, and the Nonproliferation Center. It was concluded that there would not be any significant gains from that action, so DEFSMAC remained an NSA/DIA joint operation with USSPACECOM and Air Intelligence Agency participation.[111]

~~(S)~~ In 1994 W1 was transformed into W9W, Space and Weapons Science; and W4 became W9Q, DEFSMAC. The Group W name was changed to Technical SIGINT Exploitation Group, and included the former [redacted] W9D, Deployments. The W9Q/DEFSMAC SIGINT tasking function was transferred to W9T, Target Access. All administrative support for all of W9 was centralized in W9G, Group Support. W Group now included Information Systems (W9C); Weapons and Space, now called Space and Weapons Science (W9W); ELINT and PROFORMA, now called Military Applications (W9M); the [redacted] program, now called Deployments (W9D); and Signals Analysis (W9S). Figure 155 shows DEFSMAC's relationship to the new W Group and the other SIGINT Directorate Groups. The DIA contingent in DEFSMAC reported to the DIA National Military Intelligence Collection Center. Also in 1994, the "B Group" [redacted] representative "position" in DEFSMAC was changed from a full time "watch" position to a "call-in" position. In 1995 Group W made some minor organization shifts that did not affect DEFSMAC and was renamed as the Global Signals Technology and Combat Support Group.

1.4(c) [redacted]

(S) Fig. 155. NSA/CSS 1994 organization

(S) DEFSMAC had over [redacted] electrical communications circuits to various collection facilities and users of DEFSMAC intelligence product reports at the start of the 1990s. Some of these were to [redacted] networks that allowed [redacted] other organizations to receive DEFSMAC information, and provide information to the Center.[112] By DEFSMAC count, there were [redacted] intelligence and military organizations that received some form of DEFSMAC reports in 1993, based on [redacted] missile/space launches that year. Only through automation was the center able to keep up with its increasingly diverse requirements on foreign missile/space activities.

(U//FOUO) Nineteen ninety-four marked the 30th anniversary of DEFSMAC, and an appropriate ceremony was held. To commemorate the 30th anniversary, several photographs were taken of the operations and intelligence reporting areas at that time; they appear below and on the next page.

PL 86-36/50 USC 3605 [redacted]

(U) Fig. 156. DEFSMAC 30th anniversary commemorative cake cutting with Duey Lopes, Director, DIA Central MASINT Organization, and Barbara McNamara, Executive Director, NSA

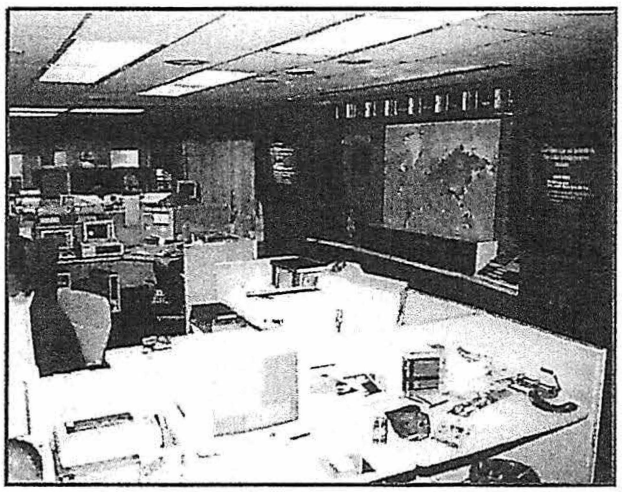
PL 86-36/50 USC 3605 [redacted]

~~(C)~~ Fig. 158. DEFSMAC mission directors and operations management work areas

PL 86-36/50 USC 3605

[redacted]

~~(S)~~ Fig. 159. Typical analyst work areas



~~(S)~~ Fig.160. Watch operations displays

PL 86-36/50 USC 3605

[redacted]

~~(S)~~ Fig.161. Manned operations transcription position

~~(C)~~ In 1998 W9Q became W9D and now included the former analytic elements of W1 (W14 and then W9W) that covered space as W9D5. The element that included missile analysis and reporting (W15 for many years) now became W9D7. Other functions formerly in other parts of W Group also became part of W9D. Target Plans became W9D2, and report dissemination became W9D3. Language analysis became W9D8, and the Telemetry and Beacon Analysis Committee (TEBAC) was also attached to W9D as was the NSA representative to WSSIC. All in all there were [redacted] people, including a few contractor personnel. The original DEFSMAC data support function was still located in DEFSMAC spaces but was now part of W9C, Information Systems, and in 1997 would become E234, part of the new E Group, Information Technology Applications Development and Support. Figure 162 shows the new organization of W9D, still to be called DEFSMAC.

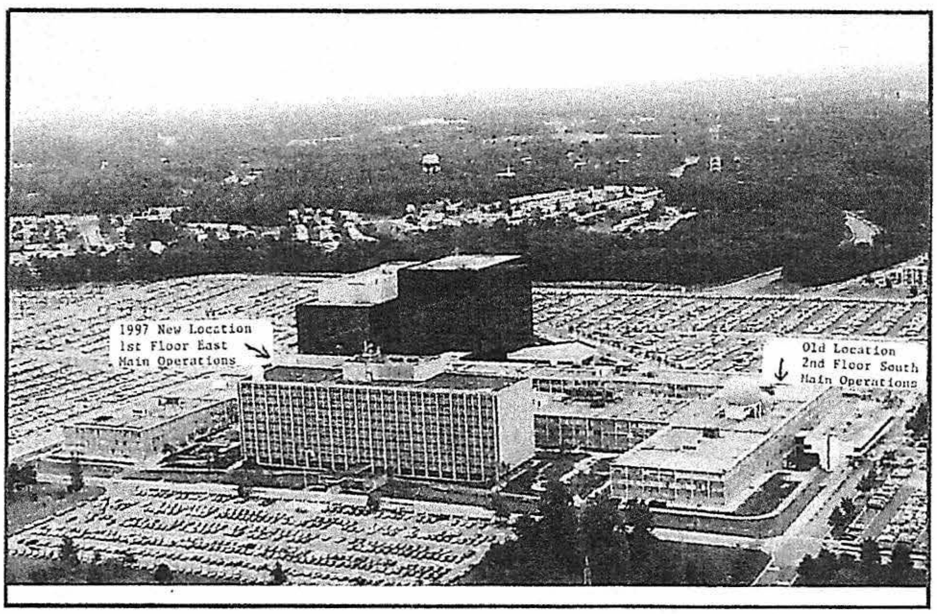
(U) When it became clear that the DEFSMAC facilities in use on the 2nd floor of the Operations Building at NSA since 1966 were no longer able to

PL 86-36/50 USC 3605 [redacted]

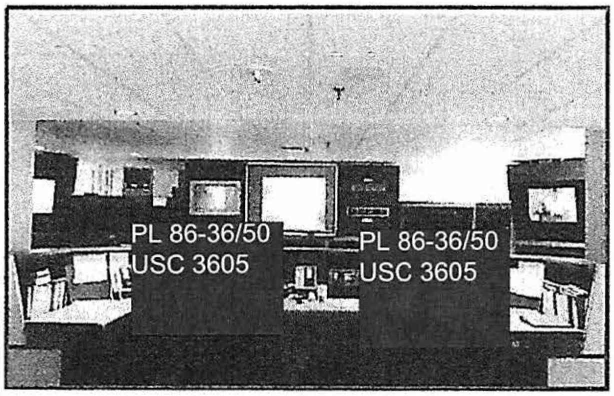
(U//FOUO) Fig. 162. DEFENSE SPECIAL MISSILE AND ASTRONAUTICS CENTER (DEFSMAC) – 1998

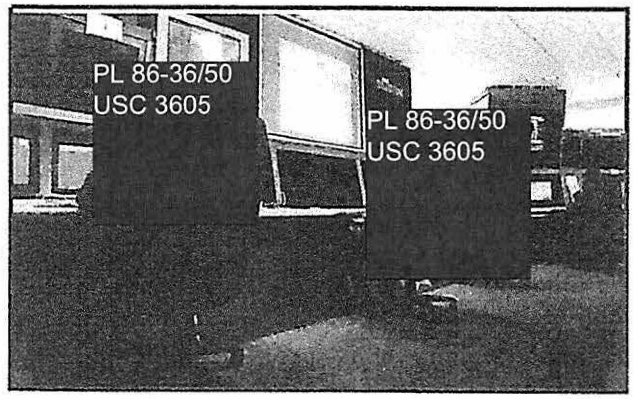
be upgraded in place, a new facility was constructed on the first floor of the NSA main operations building and was occupied in 1997. Figure 163 shows the NSA main complex and the arrows point to the old and new Center locations. The new Center was dedicated to the memory of Charles C. Tevis, the first DEFSMAC director. The commemorative inscription reads:

Founding Father
First Director
1964-196-
His vision is our reality today
and our inspiration for tomorrow.



(U) Fig. 163. DEFSMAC locations





(U//FOUO) Fig. 164. The new DEFSMAC Mission Director's console;
(U//FOUO) Fig. 165. The new Operations Analysis positions – 1998

(U) Overhead Satellite Collection

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted]

1.4(c) [redacted] 1.4(c)

1.4(c) [redacted]

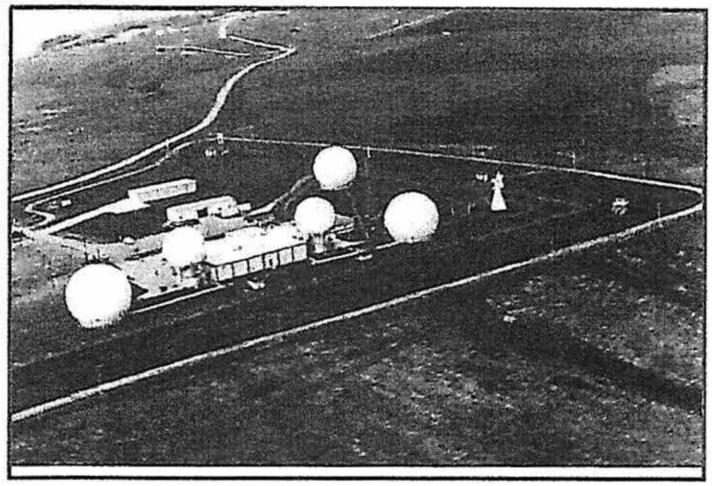
1.4(c) [redacted]

1.4(c) [redacted]

(U) Ground Collection

~~(C)~~ The 1990s saw many significant changes in ground-based FISINT collection of missile and satellite signals. One of the early momentous events was the closing of the HIPPODROME site at Sinop, Turkey, in 1992. (See figure 166.) Sinop had been the location of the first intercept of Soviet missile telemetry in 1956 and was the largest U.S.-operated FIS ground site, primarily targeted at the KYMTR launch site ESV and space probe command uplinks, and telemetry downlinks in the southwestern USSR. With the reduction of missile and space activity by the Soviets, a reduction of the intelligence priority of those targets, and the ever-increasing costs of operating the Army Field Station at Sinop, it was decided to close the entire field station by 1992.[116]

~~(S)~~ With the unification of West and East Germany and the closure of 1.4(c) [redacted] "Gap Filler" site had been closed in April 1991. The other two transportable systems in Europe, PL 86-36/50 USC 3605 [redacted] were also phased out of operation in the 1990s. Figure 167 shows the 1.4(c) [redacted] facilities.[117] This left only the 1.4(c) [redacted]



(U//FOUO) Fig. 166. HIPPODROME facility – 1992

1.4(c) [redacted]

1.4(c)

[redacted]

1.4(c)

[redacted]

1.4(c)

[redacted]

1.4(c)

[redacted]

1.4(c)

[redacted]

[redacted]

(S) The [redacted] aircraft continued their outstanding performance on missile tests throughout the 1990s and were deployed to an ever-increasing number of geographic areas as many nations expanded the development of missiles and tested them on or near international waters. [redacted]

[redacted]

(U) Fig. 181. [redacted]

[redacted] information.[123] [redacted] aircraft being a prime participant. (See Figure 180.)

(U) Sea-based Efforts

[redacted]

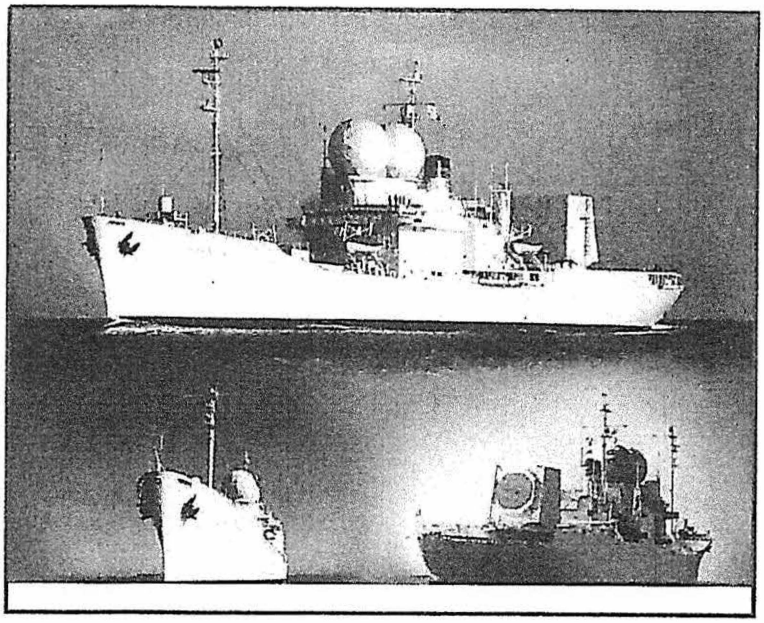
PL 86-36/50 USC 3605 [redacted]

1.4(c) [redacted]

~~(S)~~ 1.4(c) [redacted] 1.4(c) [redacted] 1.4(c) [redacted] with the U.S. Army Space and Strategic Defense Command (USASSS-DC) acting as executive agent. Prior to 1993 the ship had been funded within the GDIP and operated by the USAF, with Electronic Security Command (successor to the Air Force Security Service) providing the operation of the 1.4(c) [redacted]

1.4(c) [redacted] NAIC was the focal point for intelligence requirements and, with MIT support, processing the radar data. 1.4(c) [redacted] 1.4(c) [redacted] 1.4(c) [redacted] The DEFSMAC role was unchanged. Figure 184 portrays OBIS and clearly shows the phased array COBRA JUDY radar face 1.4(c) [redacted]

1.4(c) [redacted]



(U) Fig. 184. USNS Observation Island (OBIS)

[redacted]

[redacted]

~~(TS//SI)~~ In the 1990s there was an even further expansion of foreign communications satellites, including several foreign-controlled consortiums, that added even more to the [redacted] series, continued to be tasked to do this as needed, including the [redacted] The general term [redacted] replaced the use of the terms [redacted] since the major collection sites at [redacted]

(U) The New, Smaller Signal Detection Systems

[redacted]

1.4(c)

[redacted]

1.4(c)

[redacted]

[redacted]

~~(S)~~ Another small collection system designed to provide a [redacted] capability is the [redacted] transportable equipment suite operated by the USAF [redacted] Squadron.[130]

(U) More [redacted]

(U) The 1990s saw an even greater use of [redacted] deployments than in the 1980s. Table 4-2 provides a list of some of these deployments.

~~(S)~~ NSA also experimented with [redacted] equipment to deal with characterizing command and control patterns from [redacted] that continuously transmit

[redacted]

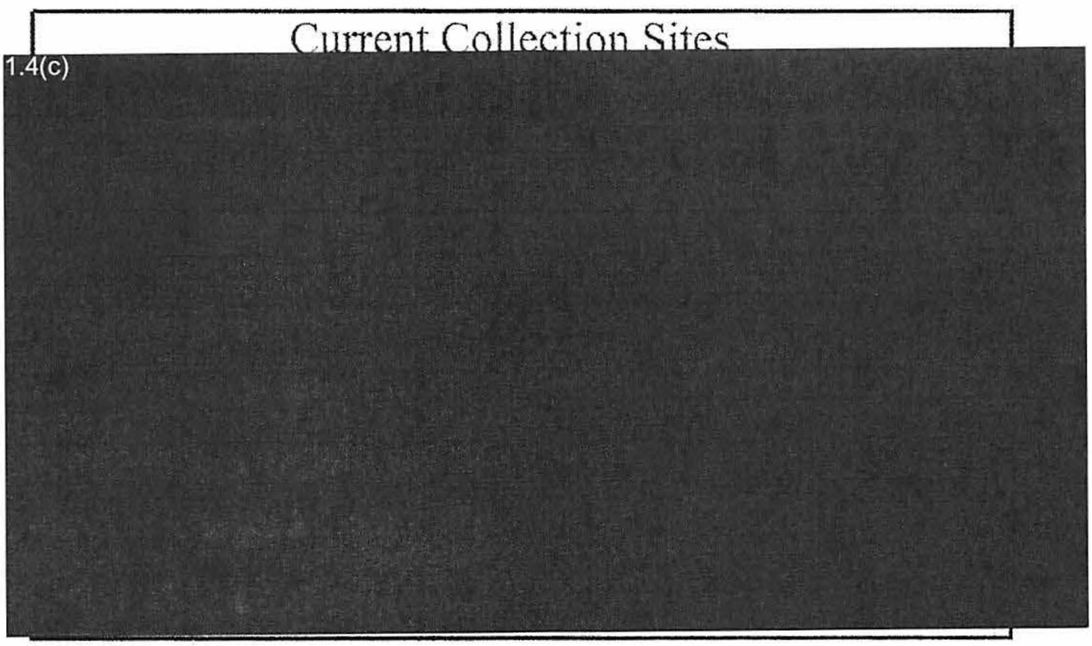
[redacted] was originally developed as a test project at [redacted] and was later tested at [redacted]

(U) Collection Summary

(TS//SI) Information on Former Soviet Union (FSU) missile and satellite activities remained a high priority during the early 1990s. There had not yet been much reduction of FSU activity. Fiscal constraints, however, dictated the early 1990s closure of HIPPODROME in Turkey and the [redacted] and the [redacted] Figure 187 shows the major remaining ground locations, including [redacted] Despite several site closures, on the positive side the new [redacted] since 1998) and the increased use of the [redacted] and the new [redacted] site added collection capabilities.

[redacted] The ongoing [redacted] collection activities took on an even more significant role since they could partially cover these collection losses, and the START agreement in late 1991, where the FSU agreed to discontinue encryption of missile telemetry enhanced the value of FISINT material on missile testing. Fiscal constraints, however, were soon to adversely affect any expansion [redacted]

(U//FOUO) The funding reductions that were imposed on the intelligence community in general precluded much development of new field collection capabilities. One area of automation that did move forward in the 1990s was the automated control of telemetry collection antennas and associated device control (e.g., receivers, demodulators, recorders). Starting in 1975, Sylvania Electronic Systems West, which became part of GTE Government Systems and is now part of General Dynamics Advanced Information Systems, became



[redacted]

(S//TK) Fig. 188. Current collection sites – 1998 the preeminent contractor for automating collection system functions. Figure 189 shows the development of these capabilities and the lists of field computer systems that were used. Note the prepon-

1.4(c)

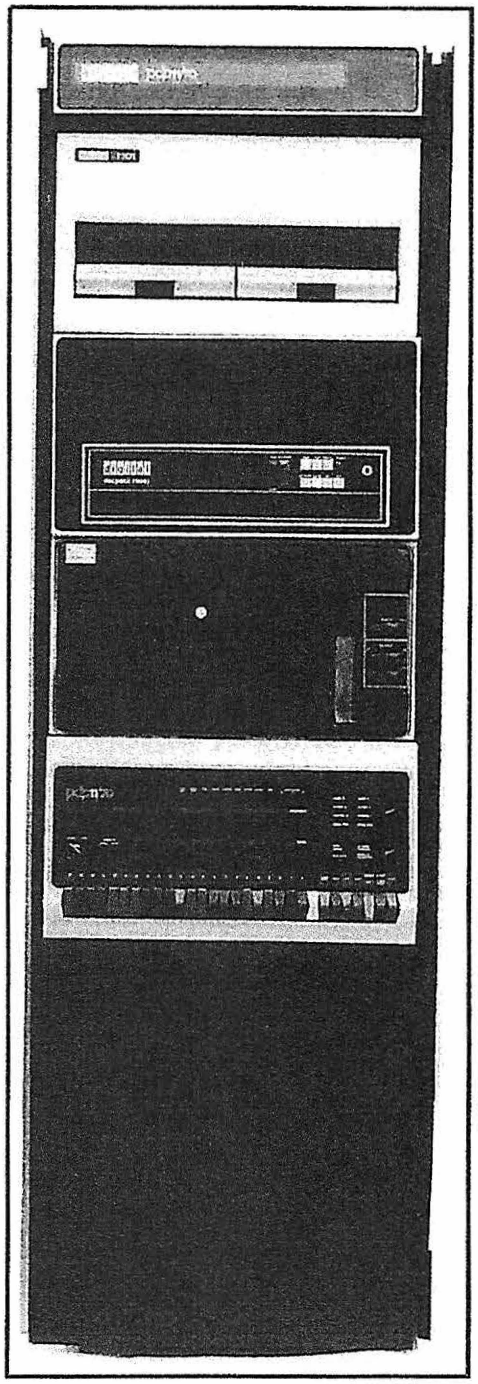
[redacted]

~~(S)~~ Fig. 189. Site automation development subsystem chart derance of DEC, VAX and PDP computers used for the mission control and automation functions. Figure 190 shows a typical PDP 11/70 computer configuration used at many of the ground sites. The project names listed are those used by GTE and are usually not the cover names used by the government. The boxed table insert in figure 183 shows the government project names.

(U) Further DEFSMAC Automation

~~(S)~~ By 1990 several important additional networking and processing initiatives had been started in DEFSMAC. The NSA time-sensitive computing environment was becoming more mature as computers were dramatically increasing in power, while decreasing in size and cost per operation, and DEFSMAC could take advantage of these improvements.[132] The computer support in the early 1990s had come a long way since the origin of the center in the 1960s, and distributed computing systems using SUN UNIX-based systems were already in place on [redacted] and the DEFSMAC local area network [redacted][3] This is illustrated in figure 191, which shows then general data flow in the center. Figure 192 gives a detailed set of flow paths and usually shows the project name, its function, and the computer model number. Figure 193 highlights the modernization architecture that was envisioned. A reference guide was also prepared that described the projects in some detail.[134]

~~(C)~~ DEFSMAC codified its requirements for both connectivity and message and data processing capabilities with a complete study in 1991; these requirements formed the basis of computer upgrades for many years. Many of these requirements were incorporated into various upgrades of the NSA National Time-Sensitive System (NTSS) during the 1990s, particularly a dedicated Tandem computer processor called [redacted] and a new UNISYS multiprocessor designated [redacted] Later a distributed processing system designated [redacted] tied all the systems together with a master database, at an investment cost of well over [redacted]



(U) Fig. 190. PDP 11/70 computer configuration

1.4(c)

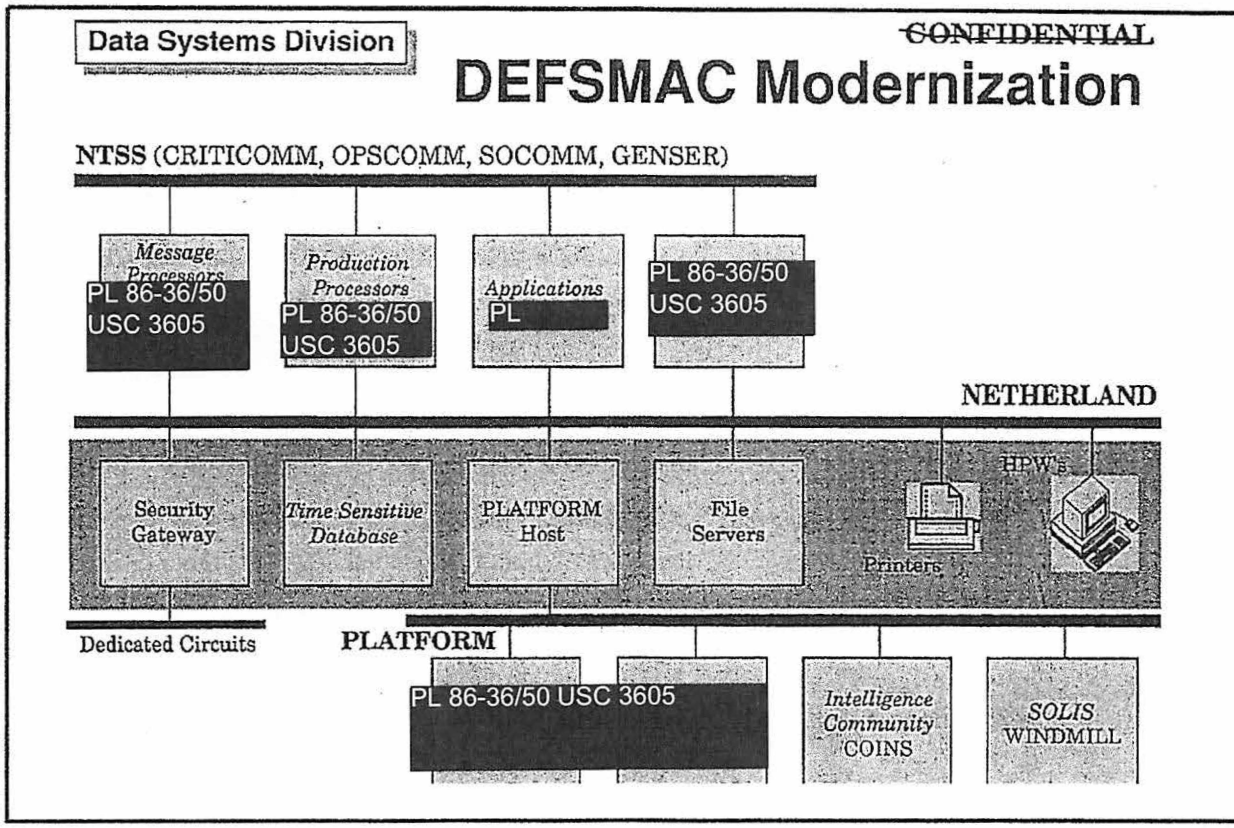
[redacted]

(S//SI) Fig. 191. DEFSMAC data flow - 1991

1.4(c)

[redacted]

(S//SI) Fig. 192. DEFSMAC data flow paths planned – 1991



(C) Fig. 193. DEFSMAC modernization interconnection for the late 1990s

(U) FIS Field Data Processing

(S) Several of the field collection systems continued to have improvements made to a field site capability to process and report telemetry data, particularly in the FISDI format, either on computer tapes, or electrically over high-capacity data communication circuits, e.g., the 1.4(c) [redacted] channel 1.4(c) [redacted] Also, to the maximum extent possible, the field sites were provided with equipment that would automate the field analysis and provide Telemetry Analysis Reports (TARs) for electrical transmission to NSA as well as produce FISDI files. Figure 194 shows a representative TAR that can be automatically generated. This particular TAR is a SUMMARY TAR from 1.4(c) [redacted] 1.4(c) [redacted]

1.4(c) [redacted]

(S) Fig. 194. Automatically generated TAR example

1.4(c) [redacted]

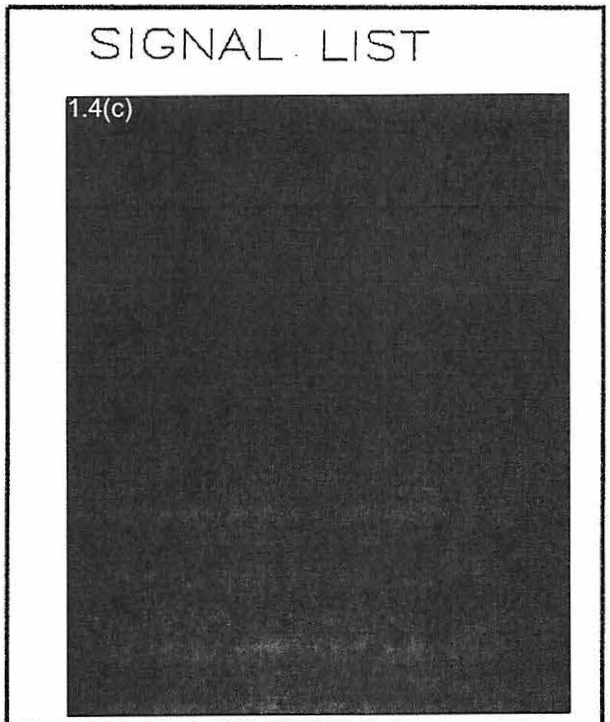
PL 86-36/50 USC 3605 [redacted]

(U//FOUO) Fig. 195. PL 86-36/50 USC 3605 [redacted]

~~(S)~~ By the early 1990s, the major field telemetry processors were 1.4(c) [redacted] and HIPPODROME. Figure 195 shows the rack layout for 1.4(c) [redacted] Figures 196 and 197 show the equipment nomenclature and list the signals that could be processed by the system. The 1.4(c) [redacted] equipment was removed from HIPPODROME upon its closure in 1992 and used as spare parts for 1.4(c) [redacted] DELF at the 1.4(c) [redacted] locations produced TARs and FISDI computer data files. A DELF system was also provided to 1.4(c) [redacted] location. NAIC and NSA had also installed DELF systems in their CONUS processing centers; they were called

PL 86-36/50 USC 3605 [redacted]

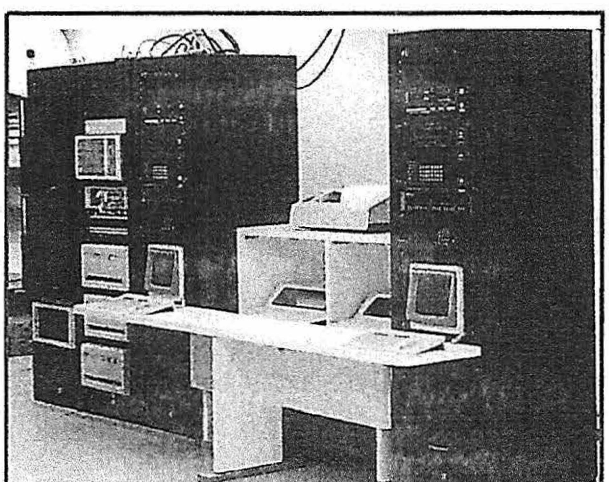
(U//FOUO) Fig. 196 PL 86-36/50 USC 3605 [redacted]


SIGNAL LIST

[redacted]

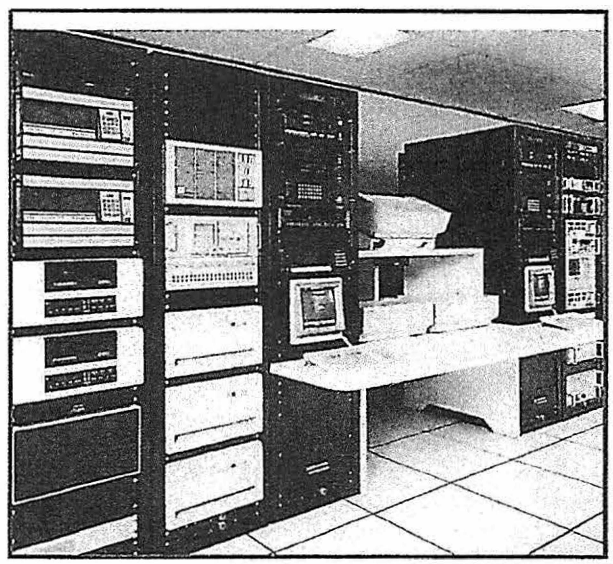
(S) Fig. 197. [redacted] signals

[redacted] respectively. Figure 198 shows the DELF upgrade performed in 1990.



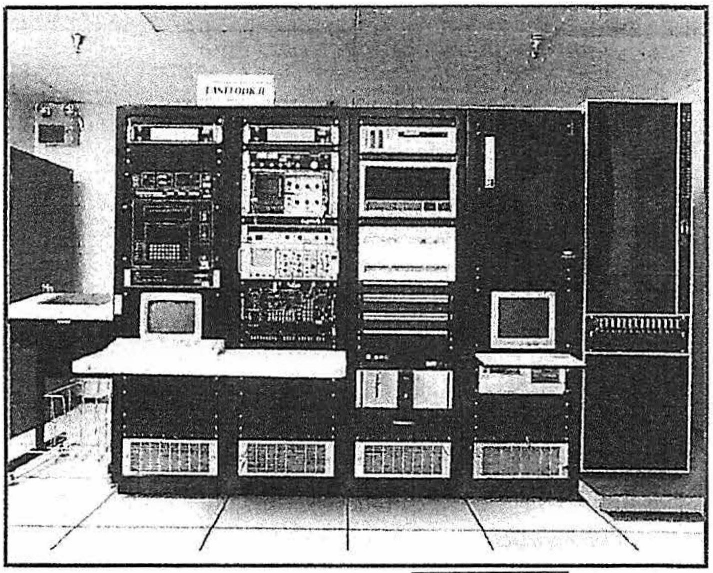
(U//FOUO) Fig. 198. DELF upgrade in 1990

(TS) The [redacted] processors had been developed by Loral/FWS/EMR to be installed at the USAF-operated sites at [redacted] They were based on the EMR 7511 Frame Synchronization Unit. One was also installed at [redacted] and one had been provided to the [redacted] for use on [redacted] replacement and one for the [redacted] system called the Special Purpose Analysis System (SPAS). The [redacted] unit was called TAPSS (Telemetry Analysis and Processing subsystem). Figure 199 shows an [redacted] The processors produced TAR reports and could handle [redacted] telemetry as well as most [redacted] telemetry. They used PDP and VAX computers, the basis of many field telemetry processors up until the early 1990s. [redacted] has all hardware-based signal processor "cards" and has a printer and graphic plotter for use at the field site and produces FISDI digital computer data files for use at NSA.



(U//FOUO) Fig. 199. [redacted]

[redacted] Another field analysis and reporting system called [redacted] was in operation at several locations; one was provided to the [redacted] [redacted] is for medium-size locations and produces TAR reports but



(U//FOUO) Fig. 200. [redacted]

[redacted][35] Figure 200 shows a [redacted] in 1992.

~~(TS//TK)~~ In the late 1990s, based on some original development work for processors for what is called the "EVAL" or "evaluation" [redacted] developed the [redacted] processor for ground-based collection systems. Again, the primary outputs were TAR-formatted reports for data transmission to NSA and FISDI data files for the most common satellite telemetry signals.

[redacted]

[redacted] was also purchased by NAIC for their processing facility and one for the NSA space signals evaluation laboratory.[136]

~~(TS//SI/TK)~~ While significant strides were taken in the 1990s with respect to automating the generation of field signal analysis reports and generating FISDI data files, a corresponding improvement [redacted] were provided with the capability to automatically forward FISDI files from [redacted] targets. FISDI computer magnetic tapes have to be requested to be forwarded from all the other sites case by case.

(U//FOUO) Electro-Mechanical Research (EMR), which was absorbed into Fairchild-Weston Systems (FWS), then became part of Loral Data Systems and then part of Lockheed Martin, maintained a continuing role in developing automated signal processing systems up through the 1990s. In particular they developed the DELF, [redacted] and [redacted] systems described above. This type of equipment was often integrated into the field systems, or operated and "stand alone" systems at NSA/NTPC or other FIS processing and analysis locations. When Loral – Strategic Systems Operation (SSO, formerly part of the WDL portion of Philco-Ford) purchased FWS, they attempted to transfer the FWS capability to the Maryland area, but many of the key personnel did not wish to relocate. The last two [redacted] were built by Loral in Florida in 1999 using some of the Florida personnel. Lockheed-Martin now owns and manages the SSO facilities in Maryland. For a brief time ManTech Real-Time Systems Laboratory tried unsuccessfully to keep the Florida portion of FWS going in this very specialized business area. And most all of the newest generation of FIS processing equipment is completely digitally based and controlled by computer software modules for each signal (e.g., [redacted] rather than having specific hardware modules designed and built for each signal. ZETA Corporation is the leader for this approach.

(U//FOUO) The former ESL, which became part of TRW (which became part of Northrop Grumman in 2002) has a long history of telemetry processing. TRW both built equipment for processing, particularly [redacted] processing, and operated a processing facility (DERF). They were a key contributor [redacted] at a major ground station. The ESL operation in Sunnyvale, California, also suffered a reduction in business in the FIS processing area and has now relocated to a smaller facility in San Jose, California. NSA phased out the effort for TRW to operate the DERF FIS processing facility in the late 1990s when [redacted] ESL continues to develop, install, and maintain [redacted]

(U//FOUO) E-Systems, now part of Raytheon, also was a producer of signals processing equipment, particularly for the [redacted] (e.g., [redacted] and for the [redacted] aircraft. HRB Systems is also a long-time developer of signal processing equipment (e.g., [redacted] and is also now part of Raytheon - E-Systems. The capabilities of both HRB and E-Systems were reduced considerably in the late 1990s, primarily due to lack of business in their previous areas of expertise.

(U) The FISINT Reductions Get Addressed

~~(S)~~ The demise of the Soviet Union and the reallocation of FIS signal data processing brought about a significant reduction in funding for NSA FIS data processing. In 1990 NSA was allocated about [redacted] for FIS signal processing equipment. This was reduced to about [redacted] in 1995 and [redacted] in 1998. Similarly, the analytic work force was reduced from about [redacted] people [redacted] NSA and [redacted] contractor) in 1990 to only about [redacted] people in 1997 [redacted] NSA and [redacted] contractor), with about [redacted] concentrated on [redacted] These reductions caused great concern within NSA, and the corresponding reductions throughout the community on FIS and ELINT resources caused the Associate Director of Intelligence for Military Support to hold a conference in 1997 to discuss the situation. The NSA presentation to the meeting showed that the NSA budget for FIS processing systems had dropped from [redacted] in 1990 to [redacted] in 1995, [redacted] in 1997 and [redacted] in 1998. NSA's weapons and space analysis and reporting personnel had dropped from [redacted] in 1990 to [redacted] in 1995 and [redacted] in 1997, including contractor-provided analysts.

~~(S)~~ It was clear by 1993 that the weapons signals processing and analysis portion of the intelligence community needed to become more efficient and to reduce expenditures and effort. A community-wide study was conducted in 1993 using the Total Quality Management (TQM) process. Several recommendations were made for all aspects of the FISINT (and other facets of technical SIGINT) contributors to weapons signals processing and analysis. This is often referred to as the "Studeman Study," since it was initiated by VADM Studeman, USN, when he was the deputy DCI. A key finding was "Available resources for [redacted]

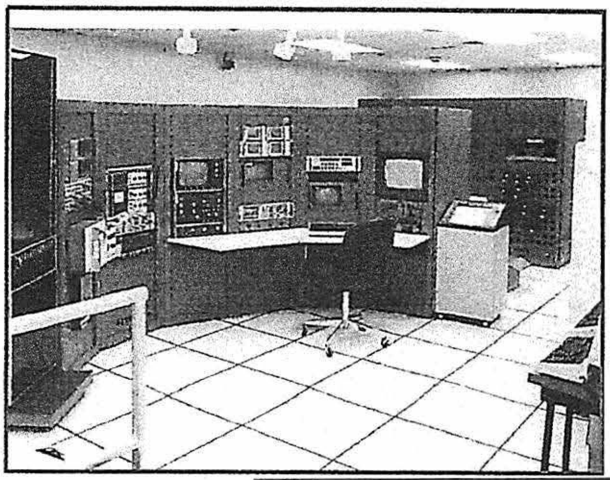
[redacted]

(S) By June of 1997 the USIB Weapons and Space Systems Subcommittee had also completed a study on Technical SIGINT (FIS, Technical ELINT, and PROFORMA) that documented the overall funding and personnel problems, including training. The critical nature [redacted] was summarized as follows:

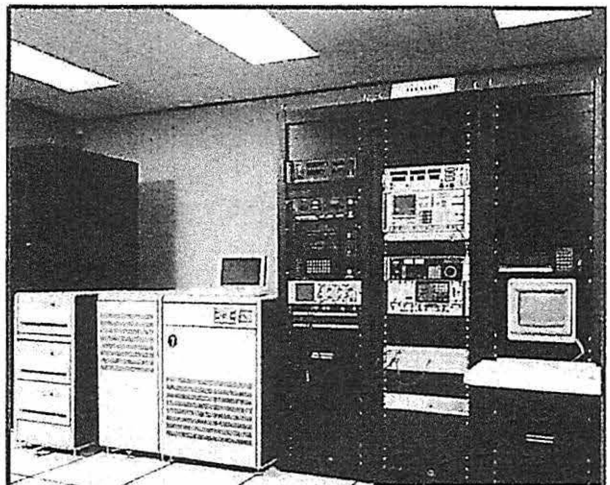
[redacted]

(U) CONUS-based FIS Signal Processing

(C) [redacted] the major portion of the FIS signal processing equipment located at the south end of the third floor in OPS-1 and in some portions of the south end of the second floor became excess to NSA's needs. This included two Cray computers that had been located in the basement to process [redacted] telemetry signals. Figure 201 shows the [redacted] built by TRW/ESL in the late 1970s, and used for many years at TRW and at NSA for [redacted] processing.

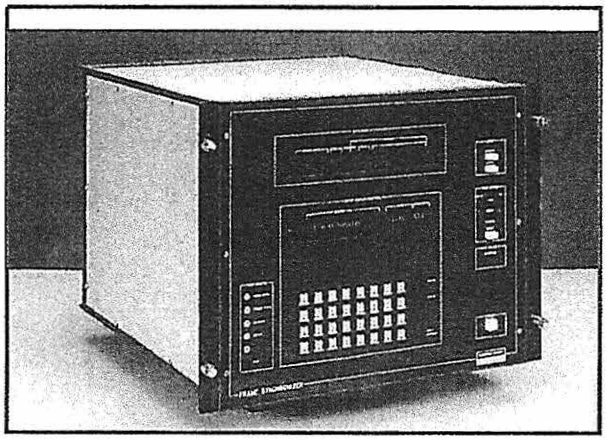


(U//FOUO) Fig. 201. [redacted]



(U//FOUO) Fig. 202. [redacted]

(S) At the end of the 1990s, the NSA processing equipment now located in the south end of the basement of the OPS-1 building occupied only a few 40' x 40' bays of space compared to the numerous bays previously occupied on the 2nd and 3rd floors of the south end of OPS-1. One of the two primary systems is called [redacted] based on [redacted] (sometimes called [redacted] which is actually an acronym for [redacted] Front End Processor). It processes primarily [redacted] downlinked telemetry signals. Figure 202 shows [redacted] built in 1991 and still used the versatile FWS [redacted] Frame Synchronizer first built in the early 1980s. (See Figure 203.)There are [redacted] positions at NSA. The other main system is called [redacted] (or [redacted] based on [redacted] which processes the ICBM and SLBM START regime telemetry tapes provided to the U.S. by the Russians. The output of both systems provides data to [redacted] the FIS signals database and the actual FIS signals in FISDI format. The signals also are available to [redacted] for distribution to other analytic cen-



(U//FOUO) Fig. 203. FWS 7511 Frame Synchronizer

ters. Figure 204 shows the overall FIS data flow for the NSA center.

PL 86-36/50 USC 3605 [redacted]

~~(S)~~ Fig. 204. PL 86-36/50 USC 3605 [redacted]

(U) Important Analytic Results

~~(S)~~ In 1990 and 1991, the U.S. was faced with a potential, and then a real "hot war" situation with Iraq as the "enemy." Building on the capabilities long in place in DEFSMAC to detect, analyze and report on foreign missile events, DEFSMAC was the pre-eminent organization to issue valid CRITICS on Iraqi SCUD missile launches. DEFSMAC had 1.4(c) [redacted] tial reporting of Soviet testing of MRBMs, including SCUDs, using SIGINT and MASINT sensors and the authorities of NSA and DIA. DEFSMAC was able to orchestrate the reliable detection and reporting of Iraqi SCUD activities that was useful not only for attack alerts but for tip-off to coalition airborne "SCUD hunters" as well.[140]

~~(S)~~ With the expansion of missile and space activities to many countries in the 1990s, the 1.4(c) [redacted] mechanism, which could bring into play many airborne and sea-based platforms, became a versatile and valuable source of information of foreign missile and space launches, particularly on 1.4(c) [redacted] events.[141]

~~(TS//SI//TK)~~ 1.4(c) [redacted]

~~(S//SI)~~ Sometimes there is information to be gained even with what are considered to be "failures" in collection. 1.4(c) [redacted] significant concern generated throughout the intelligence community, and Congress on this "intelligence failure." DIRNSA requested that the director of DEFSMAC lead an intelligence community review of tasking policy and procedures for such

1.4(c) [redacted]

~~(TS//SI//TK)~~ Fig. 205 1.4(c) [redacted] Assets

important events.[142] The resulting review and analysis resulted in improving the SIGINT collection posture applicable to all foreign rest-of-world (ROW) missile tests. The results also included a Weapons and Space Systems Intelligence Committee (WSSIC) draft document for future data requirements and collection strategy 1.4(c) [redacted]

~~(TS//SI//TK)~~ 1.4(c) [redacted] available SIGINT and MASINT collection assets were alerted, and most had successful collection, including telemetry 1.4(c) [redacted] Figure 205 shows the 1.4(c) [redacted] Figure 206 shows the initial DEFSMAC launch report 1.4(c) [redacted] Figure 207 shows that DEFSMAC recognized the possibility of the event being 1.4(c) [redacted] Figure 208 shows an artist's concept of the North Korean missile arsenal, including the expected Taepo Dong-2 ICBM. 1.4(c) [redacted]

1.4(c) [redacted]

~~(S)~~ Fig. 206 1.4(c) [redacted]

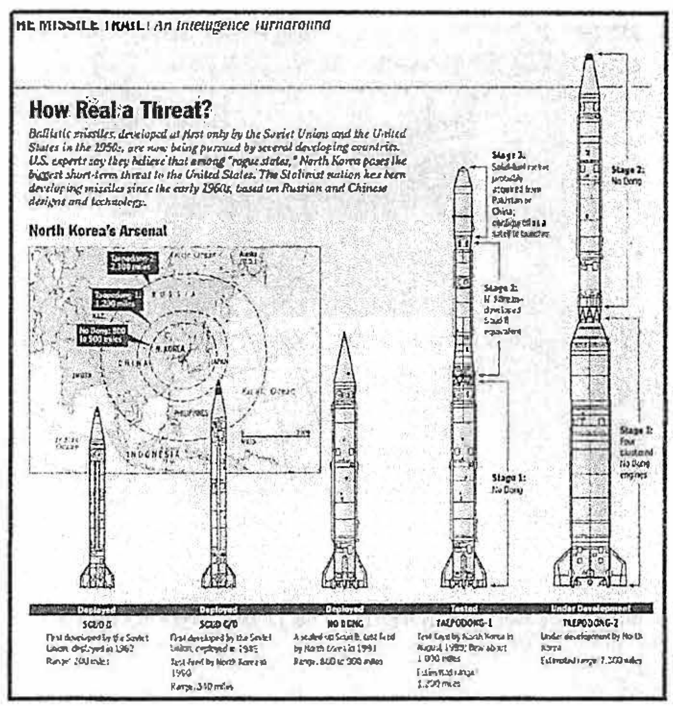
~~(S)~~ The decade started with the expanded reporting of Operational FIS (OPFIS) "TACREP" reports from DEFSMAC to U.S. Space Command (USSPACECOM) of Russian operational use of their reconnaissance satellites. SPACECOM had encouraged DEFSMAC/NSA to initiate this reporting for many years, and had even offered to provide

1.4(c) [redacted]

~~(S)~~ Fig. 207 1.4(c) [redacted]

additional manpower for the DEFSMAC center to accomplish this function. DEFSMAC and the USAF Electronic Security Command (ESC) signed an MOU for ESC to provide 1.4 [redacted] USAF analysts to DEFSMAC in provide analysis and reporting support to the 1.4(c) [redacted] TACREP reporting. This was modified in 1994 to reduce the number to 1.4(c) [redacted] Inadequate funding had precluded building up this capability at DEFSMAC, at NSA, and at the field FISINT collection sites, which were decreasing in numbers. With the demise of the Soviet Union, the priority of the requirement had diminished. DEFSMAC stopped issuing these tactical advisories in 1998, as the priority dropped, fewer data were available to report, and reporting efforts required personal attention of an ever-decreasing DEFSMAC workforce. Critical data of this type are still provided directly to SPACECOM by DEFSMAC on operational data and voice channels. Other users such as DIA can retrieve the data PL 86-36/50 USC 3605 [redacted] as needed.[144]

1.4(c) [redacted]



(U) Fig. 208. Artist's concept of North Korean missile arsenal ("The Missile Trial/An Intelligence Turnaround," Washington Post, 14 January 2002)

~~(TS//SI//TK)~~ The diversity of missile and space events by the mid-1990s detected and reported by DEFSMAC in 1994 is illustrated by the facts that 1.4(c) [redacted]

(U) Summary

~~(S)~~ Information on Former Soviet Union (FSU) missile and satellite activities remained a high priority during the early 1990s. There had not yet been much reduction of FSU activity. Fiscal constraints, however, dictated the early 1990s' closure of HIPPODROME in Turkey and the 1.4(c) [redacted] The ongoing 1.4(c) [redacted] collection activities took on an even more significant role since they could partially cover these collection losses, and the START agreement in late 1991, where the FSU agreed to discontinue encryption of missile telemetry enhanced the value of FISINT material on missile testing. Fiscal constraints, however, were soon to adversely affect any expansion of FISINT collection 1.4(c) [redacted] site consistently provided the "first reports" of new signals and field analysis of FISINT on satellites 1.4(c) [redacted]

(U) As the expansion of telemetry signals continued as the rest of the world (ROW) began testing and launching missiles and satellites, and the use of telemetry in other areas of intelligence interest also expanded, NSA prepared a study of expected telemetry use in the 21st century that could challenge FIS collection and processing resources.[147]

(U) 1990s Lessons Learned

(U) Lesson 1 – **Joint intelligence operations centers really work. The DEFSMAC (NSA, DIA, and CINCSPACE) success in detecting and reporting Iraqi SCUD missile launches during DESERT SHIELD and DESERT STORM showed the benefits of the DEFSMAC operations and reporting concepts in "hot war" situations as well as missile testing activities.** This was further confirmed at the beginning of the 1990s when USSPACECOM requested OPFIS support for their space defense mission.

(U) Lesson 2 – **You can't really do more with less anymore in the FISINT world. The reduction of operational locations and systems during the 1990s added constraints to an already difficult technical collection problem.** This was confirmed in the mid- and late 1990s with the establishment of several high-level study groups, first under DDCI (then VADM Studeman, USN) and then under USIB/WASSC in 1997. All of the studies were directed at the problems of meeting intelligence needs for technical SIGINT in the face of the declining collection and processing and analysis capabilities of the community.

(U) Lesson 3 – **When you change the focus of previously integrated functions, you lose capability. The divesting of NSA tasking of FISINT assets from Group W component (W11) of the DEFSMAC, both physically and functionally, in the mid-1990s significantly reduced the SIGINT tasking effectiveness for DEFSMAC**. The broadening of the NSA Group W charter and successive reorganizations of the NSA SIGINT organizations significantly changed the sharp focus that NSA Group W had previously been able to apply to FISINT topics.