

NATIONAL SECURITY AGENCY
FORT GEORGE G. MEADE, MARYLAND

CRYPTOLOG

AUG - SEP 1984



P.L. 86-36

DIRECTOR'S REMARKS:

1984 CISI SPRING CONFERENCE (U).....	Lincoln D. Faurer.....	1
THE SOVIET CENSORSHIP DILEMMA:		
MOTIVATION VS. SECRECY (U).....	[REDACTED].....	3
LONG-RANGE PLANNING AND NSA (U).....	[REDACTED].....	6
THE AT&T DIVESTITURE		
AND NATIONAL SECURITY (U).....	[REDACTED].....	10
QUALIFICATIONS OF A CRYPTANALYST (U).....	[REDACTED].....	13
LINGUISTS AND OTHER MINORITIES (U).....	[REDACTED].....	14
STUMBLING INTO SPACE (U).....	Nathaniel C. Gerson.....	18
NSA-CROSTIC NO. 57 (U).....	D.H.W.....	28

~~THIS DOCUMENT CONTAINS CODEWORD MATERIAL~~

~~TOP SECRET~~

~~CLASSIFIED BY NSA/CSSM 123-2~~
~~DECLASSIFY ON: Originating~~
~~Agency's Determination Required~~

CRYPTOLOG

P.L. 86-36

Published by Pl, Techniques and Standards

VOL. XI, No. 8-9

AUGUST-SEPTEMBER 1984

Editorial

PUBLISHER



BOARD OF EDITORS

Editor..... [redacted] (963-3045s)
Production..... [redacted] (963-3369s)

Collection..... [redacted] (963-3961s)
Computer Security [redacted] (859-6044)
Cryptolinguistics. [redacted] (963-1103s)
Data Systems..... [redacted] (963-4953s)
Information Science [redacted] (963-5711s)
Puzzles.....David H. Williams (963-1103s)
Special Research....Vera R. Filby (968-7119s)
Traffic Analysis..Robert J. Hanyok (968-8418s)

Just ten years ago this month, the first issue of CRYPTOLOG appeared. That issue was introduced to its readers by MGen Wolfe, DDO, as

"...a new vehicle for the interchange of ideas on technical subjects in Operations. Operations is a large organization; the skills and talents on which we depend are many, our workings widely scattered and often sequestered in compartments. These conditions argue for special efforts to keep us in touch with each other and with new problems as they arise and new solutions as they are developed...To be successful, CRYPTOLOG must reflect current operational topics in a way that interests you and others. I hope that you will want to read it and will help write it."

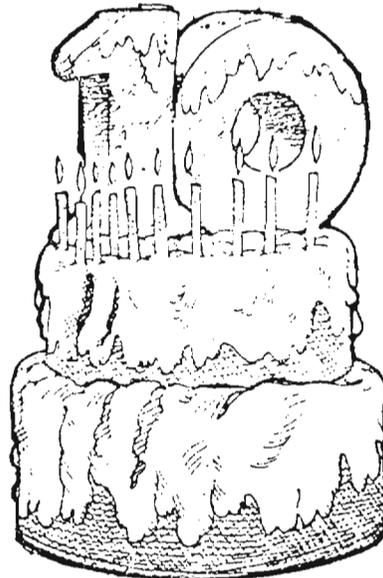
For subscriptions
send name and organization
to: [redacted] P14

To submit articles or letters
by mail, to: Pl, Cryptolog

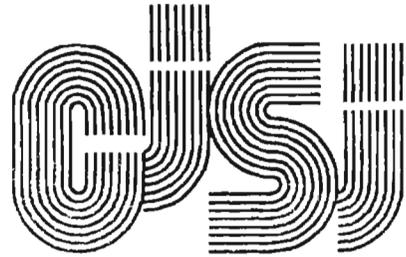
via PLATFORM mail, send to:
cryptolg at barlc05
(bar-one-c-zero-five)
(note: no '0' in 'log')

Looking back over the decade, it is clear that a lot of people have wanted to read it, and quite a few have helped write it, and many more have helped to get the magazine out, working behind the scenes in a variety of ways. Whatever its success, it has been the result of many willing people.

Contents of Cryptolog should not be reproduced, or further disseminated outside the National Security Agency without the permission of the Publisher. Inquiries regarding reproduction and dissemination should be directed to the Editor.



OPENING REMARKS: 1984 SPRING (U) CONFERENCE



LT. GEN. LINCOLN D. FAURER,

Director, NSA/CSS

Good morning. I'm happy to be able to open the 1984 CISI Spring Conference and I can't think of a more appropriate and timely topic than "Personal Computing." In the course of the next four and a half days, nearly every facet of personal computing at NSA will be covered in the various sessions and demonstrations which are listed in your programs. I urge you to attend as many of these as your time permits. Whether you are a newcomer to NSA, or an NSA veteran new to personal computers, or a seasoned NSA computer professional, I think you will find this a worthwhile conference.

In the next few minutes, I will give you some of my ideas about personal computing and the role I believe it should have in our future.

This Agency has had a long history of leadership in the application of the very latest technology to our missions. From our earliest days at Arlington Hall during World War II to the present, computers have been an indispensable tool to both the SIGINT and COMSEC professional. By the early 1960's, vacuum tube computers had been replaced by second generation transistor machines and the first software operating systems made their appearance. Users could now submit their jobs in the form of punched card decks and magnetic tapes "over-the-counter" for operators to run. Computers were extremely expensive and these jobs were batched up for efficiency and run sequentially on the machines. The emphasis was on machine efficiency--not "people efficiency".

As hardware increased in speed and capability and decreased in price, new software techniques made operating systems possible which could run a number of programs seemingly at once. Communications hardware and timesharing software made it possible to put computer ter-

minals remote from the main computer and for the first time, analysts and users of all kinds were able to access programs and data from their work areas and not make the trip to the basement. Terminals were still often shared, however. They simply cost too much to put on every desktop.

By the mid-1970's, the teletype type of terminal was giving way to the CRT terminal and by the end of the 1970's, many of these terminals (now considered "intelligent" with their own microcomputers inside) were being connected to smaller mini-computers which were able to communicate with the large mainframe computers over the PLATFORM network. Although computing capacity and service continued to improve, in many cases the user was still totally dependent for even the simplest processing tasks upon computers and professional programmers over which he had little control.

In 1978, K. Speierman, then the Assistant Deputy Director for Telecommunications and Computer Services, began the first systematic introduction of commercial personal computers into NSA. Encouraged by a few experimenters in various parts of the Agency who were using these inexpensive machines to solve problems in telemetry, signals, and cryptanalysis, he arranged to buy a half-dozen Radio Shack TRS-80's and he gave them to analysts in various parts of the Agency to evaluate in their work. The result was a real but not unqualified success, as you might expect. It often took the analysts longer to poke in their traffic than it did to run the programs against it. Many did this willingly, however, because for the first time, it gave the analyst direct control over some part of his processing using his personal computer. Nonetheless, it became clear that to be really useful, we needed to connect these personal computers to the larger computers that already processed our signals and traffic.

As the demand for personal computers increased throughout the Agency, the need for TEMPEST-qualified personal computers, and for standards in hardware and software were necessary. Since DDT already had a program underway to replace computer terminals with full-fledged personal computers through a competitive procurement, some interim standards were established for both hardware and software.

The same situation existed in the office automation arena. Again, interim standards were established and DDT initiated the Agency's Office Automation Program (which includes an Executive Support System) to help those of us at every level who manage this large, complex organization.

Last year, DDT also established a personal computer "store"--the PCIC or Personal Computing Information Center--where Agency "customers" can obtain computers and software, get information and demonstrations, and be assured of continued maintenance and support and help for whatever problems they might have.

Many organizations in this Agency are making significant contributions to personal computing. DDC pioneered in using personal computers for executives and managers who needed to communicate with each other, to access project information, and to perform a variety of other office functions.

DDR has had a program to develop and promote powerful personal workstations for several years now. Many of you have seen the very impressive graphics capabilities which have been developed and which are finding their way into important SIGINT and COMSEC applications throughout the Agency. More recently, powerful symbolic processors are being evaluated as part of our Artificial Intelligence program.

Local area networks are being introduced to connect a large number of personal computers or office workstations together with PLATFORM and the major processing systems in the basement and at various other locations. The Defense Computer Security Center here at NSA is developing ways to safeguard the very sensitive data we handle in these computers and networks. Security becomes even more important as computing is decentralized and computers move out of the computer rooms.

Throughout DDO, people are continually finding new and imaginative ways to apply personal computing to their work. The SIGINT and COMSEC analysts, and people everywhere with difficult problems to solve, continue to be the pathfinders and you will have a chance to hear about their experiences during this conference.

Three years ago, an NSAAB Panel published a report on Network Architecture. In that report, they estimated that if automation could result in a modest gain in individual productivity of only 8 to 10 percent, it would pay to invest up to one-third of the average annual salary (then about \$27,000). That's \$9,000 per employee. I believe that such gains are possible for a large part of our workforce and I would like to see us aggressively planning to make that level of investment in our people. I am pleased with the progress made thus far. But, I want us to do a good deal more.

I want to see a personal computer or office workstation on the desk of every individual in this Agency who believes he or she can put it to use. I want to see these workstations interconnected on networks where sending notes, messages, files, correspondence, and reports is a routine practice--the way we do business--and as commonplace as picking up the telephone. I want to see all of our information adequately safeguarded--yet easily accessible to anyone who needs it. I want to see intelligent workstations which can do routine tasks and free people for more challenging tasks, which can help our top professionals accomplish even harder tasks than they can today, and which can capture some of the expertise of our very best analysts, managers, and planners to assist those less experienced to do a better job. I want us to continue to try to apply the very best and the very latest in hardware and software technology to our work and our problems.

While NSA has always been in the forefront of technology and its application to the very difficult and complex job we have, our people are our greatest resource. Technology is an important tool to help people work better--work smarter. This new generation of personal computing technology, when coupled with supercomputers, networks, and information storage systems, has the potential to do just that.

Just as the personal, family automobile changed the face of America, so will personal computing. Just as the automobile brought with it problems such as congestion and pollution, so personal computing will not be without its problems such as security and information management. Nonetheless, just as the private automobile brought with it the opportunity for people to expand their personal and professional horizons, so too will personal computing in ways which we are only beginning to imagine. I would urge you--whatever your job might be--to continue to look for those opportunities. We at NSA are indeed fortunate to be a part of the beginning as well as the future of personal computing.

THE SOVIET CENSORSHIP DILEMMA:

MOTIVATION VS. SECRECY (U)

by

Soviet elections are usually the subject of ridicule in the west because of the lack of choice at the ballot box. However, they play a crucial (U) role in legitimizing the Soviet leadership and the political system as a whole, and are the focus of exaggerated media attention whenever they are held. For about two months prior to each election, the newspapers are full of accounts of the nomination of Ivan Ivanovich to be a deputy to this or that Soviet, and subsequent accounts of his meeting with prospective constituents. Considering that Soviet newspapers as a rule are only four pages long with the last two pages devoted to international news, sports, and weather, this makes the elections the single biggest news item of the entire "campaign" period.

(U) There is a dilemma in this orgy of media hype. Probably most people know that the USSR has an entrenched and disciplined bureaucracy devoted to press censorship. The censors' job is to assure that none of a voluminous list of "State Secrets" are exposed. High on that list apparently is any information on the Soviet defense industries. This is carried to such extremes that under normal circumstances many defense industry facilities will not be identified by name, even in the most innocuous context: key managers and experts are virtual non-persons. The censors must go crazy at election time.

(U) The process of elections is intricate: first a date must be set; electoral districts must be defined geographically; electoral commissions must be appointed to validate the nomination of candidates; the candidates (designated by the party) must be formally nominated and registered with the electoral commission; the candidates must meet with their prospective constituents; and only then are the elections held. Finally, a few days after the election, the list of deputies is published.

~~(S)~~ Each of these stages is fraught with danger for the censors. A classic example of vigilant (but too obvious) censorship backfiring occurred in 1971. The published list of electoral districts for the Tadzhik Republic elections skipped over four districts in the Leninabadskaya Oblast'. This was fairly obvious, because the districts are numbered consecutively, and the list skipped from district number 255 to 260. Theodore Shabad, a renowned expert on the USSR writing for the New York Times, noted this discrepancy and, using census data and other public information, extrapolated the existence of a "secret city" with a population of 24,000 engaged in the mining and processing of uranium. Probably as the result of severe embarrassment, the 1974 USSR Administrative-Territorial Handbook acknowledged the existence (since 1958) of the city of Chkalovsk with a population of 26,000. SIGINT and collateral information confirmed Shabad's other speculations.

(U) That episode apparently convinced the censors of the futility of totally omitting electoral districts: the practice has not been repeated. The censors have a more difficult problem with the candidates themselves. Public recognition and praise are especially important in the Soviet Union where financial incentives are not very strong for ideological as well as economic reasons. For those in the defense industries, the system is torn between the need to reward deserving personnel publicly and safeguarding "state secrets."

~~(S)~~ This problem is particularly acute in the local city elections as opposed to the Republic or National elections where a much more diffuse population is involved; Moscow elects 1,000 deputies to its city soviet every other year, but sends only a score of deputies to the USSR Supreme Soviet every four or five years. Until 1982 the censors used three devices to limit the exposure of defense industry personnel elected to the Moscow City Soviet:

1. News reports of meetings with prospective constituents generally were limited to the non-defense sectors. There were exceptions, notable by the fact that usually distinguished by the fact that the facilities were not directly identified. Even these reports were revealing though, because almost invariably the director of the enterprise introduced the candidate (usually to warm or stormy applause), and sometimes the mere identification of a director can have intelligence value.
2. Reports on the registration of candidates were spread out over several weeks and between two different newspapers with no biographic information. All that was published was the full name and electoral district of the candidate (e.g., "District 651"), so no determination of defense industry affiliation could be made.
3. The final list of deputies was published in alphabetic order by name, again giving only the electoral district of the deputy.

Because of these censorship practices, the best you could do was collect all the reporting to garner whatever identifications there were, rearrange the list of deputies in electoral district order, supply the identifications from the collected reports, and notice the remaining gaps. Since electoral districts are apportioned by section (RAJON) of the city, and deputies are chosen by their area of employment rather than residence, the result is an economic-geographic profile of Moscow, with the blanks suggesting, however tenuously, the location of defense industries and related personnel.

~~(C)~~ 1982 was different. Prior to the election of 20 June, the names and job titles (of a sort) of all (all!) the nominees were published in the two city newspapers over a two-week period from 20 May to 2 June. Thus by simply cutting and pasting (for want of a word processor), it was possible to create a list of all deputies to the Moscow City Soviet arranged by electoral district, and consequently by rajon, with the organizational affiliation of each deputy.

(U) The personality identifications provided by the press ranged from numbingly complete for the least significant individuals to super perfunctory for defense industry employees: of the 122 defense industry employees elected to the Moscow City Soviet in 1982, over 70% were identified enigmatically with "a machine building plant" (39%) or "a scientific research institute" (26%) or "a mechanical plant" (9%). These "incomplete identifica-

tions" are dead giveaways to defense industries: they're better than asterisks. Perhaps these facilities have no proper titles (not likely), or their titles may be too provocative--identifying too clearly the function of the organization; but then again the editors of the newspaper may simply want to play it safe and not get a security violation. Soviet censorship practices may generally be very predictable, but in these minor details they seem inconsistent.

(U) It seems that the Soviets themselves are often not too sure what to call these organizations. When you compare the 1980 and 1982 elections, you find the same persons identified differently. In many cases a person was identified as head of "a scientific research institute" one year and head of "a machine building plant" the next. One possible explanation is that the individuals oversee a research and production complex incorporating both an institute and a plant. So technically they could be identified with either. It's a good bet however that changing the job titles was done deliberately to be confusing.

~~(S)~~ Other examples of changing job titles are more interesting. In one instance the correct organization title was given in 1982 where it had been sanitized in 1980; in another instance two organizations that were properly identified in 1980 were sanitized in 1982. Apparently the censors or the editors or both can't make up their minds. One example is the Scientific Production Association "Kvant" (Quantum) headed by Nikolaj Stepanovich Lidorenko. In 1980 Lidorenko was properly identified, but in 1982 he was identified as "general director of a machine building plant." The Association is subordinate to the Ministry of the Electrotechnical Industry, which is not considered a defense industry. The censors' ambivalence regarding Kvant is prima facie evidence that its primary function is defense industry-related regardless of its ostensible subordination.

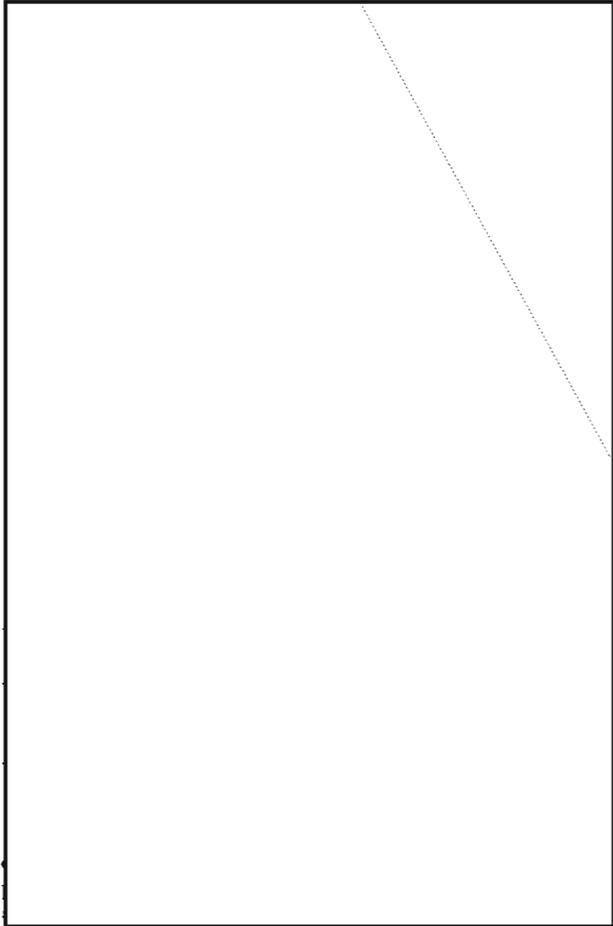
~~(C)~~ Even the enigmatic can be revealing. Yuriy Ivanovich Krashnoshchekov was identified simply as "director of a scientific research institute" in the Krasnovardejskij Rajon. A search of open literature revealed that he is a chemical laser expert. Previously he had been just another name on technical manuscripts. Now his writings may take on added significance for analysts of the Soviet laser weapons program.

(U) For the Moscow City Soviet as a whole, 12.2% of the deputies came from defense industries. The following list shows the administrative areas ranked by the number of defense industry representatives on the city soviet.

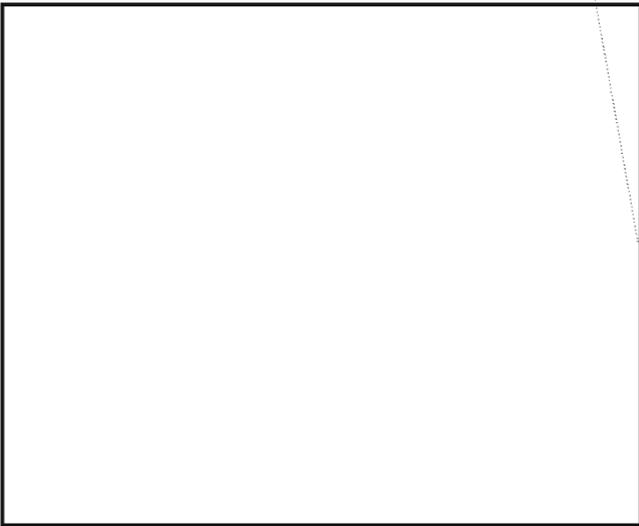
Since some areas are much larger than others, the number is also shown as a percentage of the delegation from that area; e.g., Zelenograd had only 8 deputies from the defense industries, but that represents almost half of the deputies from Zelenograd.

cause the chances are that by now they already have realized the jeopardy in repeating the 1982 procedures.

Administrative Area	Defense Industry Deputies	Percentage of Deputies from that area
Tushinskij Rajon	13	46%
Frunzenskij Rajon	9	32%
Kuntsevskij Rajon	9	26%
Zelenograd City	8	47%
Kievskij Rajon	7	25%
Kujbyshevskij Rajon	6	15%
Cheremushkinskij Rajon	6	14%
Perovskij Rajon	6	13%
Krasnogvardejskij Rajon	6	12%
Leningradskij Rajon	5	14%
Timiryazevskij Rajon	5	13%
Pervomajskij Rajon	5	12%
Kirovskij Rajon	5	10%
Dzerzhinskij Rajon	4	15%
Sovetskij Rajon	4	9%
Baumanskij Rajon	3	18%
Leninskij Rajon	2	10%
Sverdlovskij Rajon	2	10%
Sokol'nicheskij Rajon	2	10%
Lyublinskij Rajon	2	7%
Vorshilovskij Rajon	2	6%
Proletarskij Rajon	2	6%
Volgogradskij Rajon	2	5%
Kalininskij Rajon	1	6%
Zheleznodorozhnyj Rajon	1	5%
Moskvoretskij Rajon	1	5%
Krasnopresnenskij Rajon	1	4%
Babushkinskij Rajon	1	3%
Sevastopol'skij Rajon	1	3%



Gagarninskij, Zhdanovskij, and Oktyabr'skij Rajons had no defense industry deputies.



**WE ARE ALWAYS
LOOKING FOR
ARTICLES, COMMENTS,
NOTES, LETTERS,
THAT WOULD BE
OF INTEREST TO
OUR READERS**

by



Q11



LONG-RANGE PLANNING & NSA ^(u)



ong-range planning. The words glide smoothly off the tongue. Like motherhood, long-range planning has few detractors, but most give it only lip service. In actual practice we often fail to plan, even in the most important areas of our work--and, indeed, in our everyday lives. Too often we become victims to events, tossed in one direction or the other, unable in the midst of a crisis to plot an effective course. The wisdom of planning for the future is virtually self-evident: it gives our actions a reasonableness, a sense of purpose, that would otherwise be missing.

(U) What are the benefits of long-range planning? In studies that compared organizations that do such planning with those that do not, the results are conclusive: planners consistently outperform nonplanners. [1] Why? An important reason is that organizations without long-range planning tend to concentrate on what they are already doing. They try to improve their present operations by doing more, being more efficient, and working harder. And this often works. But sometimes the "try harder" approach fails, not because the people don't work harder but because the external conditions have changed. The current strategies of the organization, those that may have served so well in the past, no longer apply. Perhaps technological change has caused the dilemma, and the change may be so extensive that the organization no longer serves a useful purpose. Alvin Toffler refers to this problem in *Future Shock* when he describes "Rising rates of change [that] compel us not merely to cope with a faster flow, but with more and more situations to which previous personal experience does not apply." [2]

"If we could first know where we are and whither we are tending, we could better judge what to do and how to do it."

--Abraham Lincoln

(U) Effective long-range planning concentrates on what we should be doing now to prepare for, say, 15 years from now. This perspective encourages the consideration of creative, nontraditional approaches. It prompts us to think about where we want to be and how to get there from where we are, as opposed to concentrating only on today's problems. It is truly an opportunity to try to "invent" our future.

(U) With the above as background, let's take a look at the Agency's long-range planning efforts.

~~(C)~~ Long-range planning at NSA has a rather brief but rocky history. Although the Agency was created by Presidential Order in 1952, it was not until 1974 that the Director, General Allen, recognized the need to develop an effective long-range planning system, particularly for SIGINT. Some long-range planning may have been going on during this 22-year interval, but the Agency had no overall long-range planning system. Our planning was often fragmented and uncoordinated by the various organizational elements. All too often it was focused on and driven by the near-term concerns of the programming and budgetary processes and by what was of current interest to intelligence users.

~~(C-CCO)~~ There is no simple explanation for why it took so long for the Agency to recognize the need for a long-range planning system. One reason might be that the discipline of long-range planning was still in its infancy and was neither well known nor widely practiced during this period. Then too, the SIGINT business was somewhat simpler in the 1950's and 60's. We didn't need to justify our actions to the Congress in such painstaking detail--and the communications signals we were collecting were relatively unsophisticated and easier to deal with. The equipment to collect and process such signals was not so complex or so terribly expensive. It could be built in our own research laboratory or purchased outside without much difficulty. But with the virtual explosion of sophisticated, high-speed signals worldwide in the 70's and the long lead times needed to develop and field the expensive equipment capable of collecting and processing such signals, long-range planning became essential.

~~(C)~~ In 1974, in response to pressures from the Intelligence Community, the Agency produced the National SIGINT Plan (NSP), our first effort "to provide a single, coherent statement of the direction in which the SIGINT effort ought to go during the next several years." [3] Because the writer of the NSP was in desperate need of help, and at the Director's urging, an Architectural Planning System was developed in 1975 and continued to function until 1979 "to establish a framework that will permit optimizing of the SIGINT system" and to help those charged with writing the NSP. [4] It was not long before an Architectural Board was created. The Board was supported by Target Architects, who were selected from appropriate target mission organizations (e.g., A Group, B Group), and by Area Architects, who focused on such topics as Collection Systems, Central Processing Systems, Exploitation Systems, and Support Systems. Unfortunately, those involved in the venture received little guidance. Their "marching orders" seemed to amount to "I'm not exactly sure what it is I want, but I'll know it when I see it." And the various Architects often did not operate through the regular line management structure of the Agency. In effect, they represented a structure apart from the regular organization, sometimes even competitive with it. Then there was the lingering problem of getting agreement on a pictorial model that represented NSA's SIGINT architecture. Any number of models were offered, but none presented a comprehensive depiction of the SIGINT System.

(U) Some of the important lessons learned from the exercise were:

- [] Before writing any plan, know who will use it, the form they want it in, and how they intend to use it;
- [] Everyone involved understood the need to plan first, but all too often there was a tendency for the plan to be controlled by the budget;
- [] If planning can be divided, divide it in a way that can be readily understood and is consistent with the organizational structure;
- [] A good plan is a good map that clearly shows what should be done, when it should be done, who should do it, and (at least roughlyly) how much it will cost; and
- [] There has to be a review or control mechanism to ensure proper execution of a plan.

~~(FOUO)~~ After 1978 the NSP became the United States SIGINT Plan (USSP), but this was merely a change in title. The problems associated with developing a comprehensive long-range planning system persisted. Various studies were performed during this period, including one by A. D. Little, a Systems Acquisitions Study, and a study on Resources Management. All pointed out that planning was not adequately performed within the Agency and all recommended substantial changes.

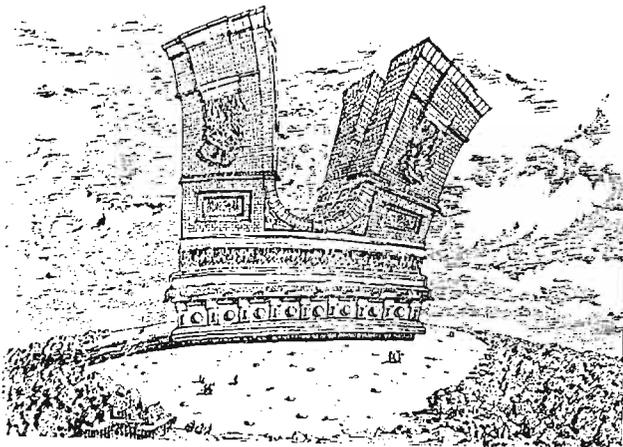
~~(FOUO)~~ Recognizing the need for a formal long-range planning system, the Director in 1980 established a new Key Component, the



Deputy Directorate for Plans and Policy (DDPP). The long-range planning function, which was formerly the responsibility of the Assistant Director for Programs and Resources (ADPR, now called DDP), now resided in the new organization, in the Directorate of Plans, Q1. It was hoped that by separating long-range planning from the short-term concerns of the budgeting and programming processes, more effective and innovative planning would result, planning that would be based on clearly defined goals and objectives.

~~(FOUO)~~ The Baseline Planning System was implemented in 1980. Two cycles of SIGINT Baseline Plans were completed, one in 1980 and the other in 1981. Only one cycle of COMSEC Baseline Plans was completed, in 1980. After affected elements received planning and procedural guidance from DDPP, they developed plans which were modified and adopted on their way up the organizational chain to the Deputy Directorate for Operations (DDO) or the Deputy Director for Communications Security (DDC), as appropriate. Various other Key Components, like the Deputy Directorate for Telecommunications (DDT) and the Deputy Directorate for Research and Engineering (DDR), were then expected to write "Response Plans" in reaction to the DDO and DDC Baseline Plans.

~~(FOUO)~~ Although an improvement over the Architectural Planning System, the Baseline System was plagued by a number of problems. Procedural guidance was provided by DDPP, but it was often inadequate to assist planners in developing effective plans. In addition, the process generated enormous amounts of paperwork, far too much for upper-level managers to have time to read and absorb. And, contrary to the intent, the system tended to produce "bottom-up" plans: lower-level managers



presented executives with long-range plans, with little or no insight as to what the executives intended as the long-range goals and objectives of the Agency. And finally, although it was intended that the Baseline Plans "drive" the program build (the process whereby plans are implemented), they actually had little or no effect on it.

~~(FOUO)~~ To create a more effective long-range planning system, one that would have the full support of senior executives, a Task Force on Planning was convened in 1982 under the direction of DDPP. It developed a "Revised Planning System." [5] The Senior Review Board (SRB), which had been formed in 1981, was reorganized in late 1982 and met, as recommended by the Task Force, to corporately guide and implement the long-range planning concepts and objectives that were proposed. The SRB is composed of the NSA/CSS Deputy Directors (DDA, DDC, DDO, DDPP, DDP, DDR, and DDT), the Assistant Directors (ADC, ADIL, and ADT), the Chief Scientist, and the Chief of Staff. Other senior managers, including SCE chiefs and chiefs of field activities, may also be invited to attend meetings, depending on topics under discussion. Initially chaired by the Deputy Director, NSA, since September 1983 the SRB has been chaired by the DDPP.

~~(FOUO)~~ The new planning system differs from the previous long-range planning systems in some important ways:

- [] there is top-down direction and control; senior managers are fully involved and support the system; corporate review and approval of plans is an essential feature of the system;
- [] planning has been institutionalized in a number of Key Components; specific organizational elements have been established primarily to do long-range planning;
- [] the long-range planning process is continuous throughout the year, rather than being a once-a-year exercise;
- [] line managers are responsible and directly accountable for plans and their implementation; and
- [] plans are based on established long-range goals and objectives, as documented in NSA/CSS Directive 25-2.

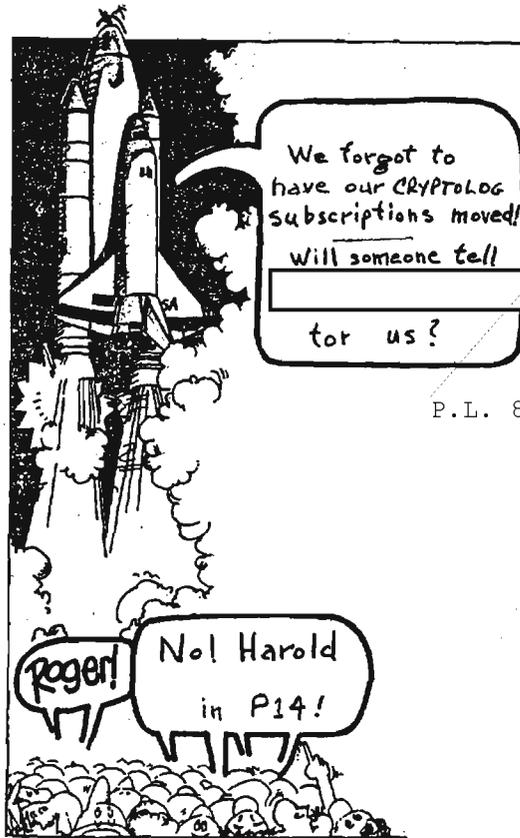
~~(C-CCO)~~ As one surveys the landscape of NSA's long-range planning efforts, it becomes increasingly clear that the task of developing and implementing a long-range planning system is extremely difficult. The rewards of an

effective system, however, are great. As the Director wrote in his guidance for the development of the FY86-90 Consolidated Cryptologic Program (CCP), "The accelerating growth and sophistication of worldwide electronic communications and weapons-related data, and a commensurate foreign effort to protect and deny information, presents an unparalleled challenge to the mission of the National Security Agency/Central Security Service.... Given the breadth and complexity of the challenges, the expanded requirements, and the rising costs we will face in the next several years, it is clear that some difficult choices will have to be made." [6]

(U) It is important that we support the Agency's long-range planning system. The new system is not perfect--it will need time to evolve and mature--but it offers the best hope for a vital, effective cryptologic effort as we face the decade of the 90's and beyond.

FOOTNOTES

1. George R. Terry and Stephen G. Franklin, Principles of Management, Richard D. Irwin, Inc., 1982, pp. 153-4.
2. Alvin Toffler, Future Shock, Random House, Inc., 1970, p. 34
3. National SIGINT Plan, 14 November 1984, p. 1.
4. Information on the Architectural Planning System is derived from a briefing given in the Friedman Auditorium on 16 December 1982 by [redacted] Jr., Chief of T2, and is used with his permission.
5. "The Revised Planning System" was retitled "NSA/CSS Planning System." The latter is formally documented in NSA/CSS Circular 25-11, dated 28 February 1984.
6. Memorandum from the Director, subject: FY86-90 Consolidated Cryptologic Program Planning Guidance, 16 March 1984.



P.L. 86-36

P.L. 86-36

SOLUTION TO NSA-CROSTIC no. 54

"Identification of [Antennas and Other] Items [on the Roof of the Operations Building 1]," L5 Memorandum by T. L. [redacted] dated 31 January 1984. P.L. 86-36

"The Exterior Retrofit...Project is entering into the final design stage. In order to install the TEMPEST shielding on the roof, all items attached to the roof...must be identified... Items not identified...will be removed and disposed of during the construction."

Solvers who had difficulty with this puzzle are advised that Word D is boustrophedonic, an adjective describing writing systems in which the lines read alternately left-to-right and right-to-left, which is the way this puzzle was set up.



On 1 January 1984 the American Telephone and Telegraph (AT&T) Company completed the terms of the divestiture agreement which spun off all local operations and the Yellow Pages into seven regional holding companies. The consent decree modified final judgment was carefully scrutinized by the courts, the Congress, the Federal Communications Commission (FCC), and the Department of Justice (DoJ) for its "public interest" considerations. However, the national security impact is only now starting to be realized. The new competitive structure of the telecommunications industry will of necessity alter the fundamental relationship between DoD and AT&T. Partly in response to concerns expressed by DoD, a Central Service Organization (CSO) has been formed. It will be jointly owned by the seven regional companies and will furnish the companies with technical assistance, such as network planning, engineering, and software development. It will also provide various consulting services and other assistance that can be more effectively provided on a centralized basis. Even though the CSO will help coordinate central planning requirements, the days when DoD could call a single point of contact (e.g., AT&T) who would provide end-to-end service for all requirements is over.

(U) Recent national security policies have recognized the dependence of our national defense on the privately owned common carriers for providing the majority of the national telecommunications for Continuity of Government (COG), National Command, Control, Communications, and Intelligence (C³I), and other critical functions. According to LTG William Hilsmann (USA, Ret.), former manager of the National Communications System (NCS), 95 to 98

percent of the DoD's communications in the US are controlled by the private sector, whereas in Europe between 65 and 70 percent of the communications network is actually operated by the military or the host government under the Post Office department. The existence of AT&T as a dominating monopoly which could provide end-to-end service and set technical standards for the industry made coordination a relatively straightforward process. The AT&T divestiture will complicate requirements for end-to-end service. More complicated and time-consuming competitive arrangements will have to be made with the Bell operating companies, equipment manufacturers, AT&T, and other long-haul carriers for communications services and equipment. The cost of communications services to DoD may rise because of the increased requirements to coordinate the various suppliers of service and the increased complexity of the contracting process.

(U) During the divestiture process, there was preoccupation by the FCC and the courts with the issue of how to move from a monopoly to a competitive environment, often to the detriment of national security and emergency preparedness concerns. DoD worked with the courts and DoJ to address the concerns. DoD worked with the courts and DoJ to address the potential conflicts between defense requirements and the new marketplace approach. Unfortunately, all the problems were not reconcilable with the divestiture and a less than ideal result has emerged. In the past DoD could count on AT&T to set standards for interoperability and, in the event of natural or man-made disaster, AT&T had the authority and power to direct personnel, equipment, and material in the execution of emergency relief operations. To fill the power vacuum created

by divestiture, the National Security Telecommunications Advisory Committee (NSTAC) was created to bring together senior executives, leaders of the major elements of the telecommunications industry, and the NCS for long-range communications planning in the new competitive environment. New technical initiatives to improve the emergency responsiveness of the nation's telecommunications systems depend heavily on the commercial common carriers. NSTAC was intended to be a source of expertise, knowledge, and insight for the President that would not otherwise be available within the Government. For the nation's emergency and defense requirements to be satisfied in the long run, members of the NSTAC will have to lay aside their competitive interests and agree on standards of operation, interoperability, and emergency procedures. It is still unclear how NSTAC members will respond to national security/emergency preparedness proposals that might adversely affect service or result in the loss of competitive edge and revenues.

~~(S)~~ The divestiture of AT&T will directly impact on NSA's telecommunications protection efforts underway in the S Organization, which has been working with the National Communications System, AT&T, and other major common carriers to protect some of their most vulnerable circuits from intercept. The divestiture adds new complexity to the telecommunications protection program, which will now require involvement of the regional and local Bell operating companies and the CSO.

~~(C)~~ National telecommunications policy planners are especially concerned at this time with the growing participation in the design, manufacture, and engineering of the telephone system infrastructure. Foreign technological capabilities and manufacturing abilities, which have resulted from cooperative foreign governmental and industrial arrangements, have strategically coincided with the divestiture of AT&T and the large-scale introduction of the new services and equipments to the telecommunications system. The US telecommunications network and industrial structure is in the process of considering and implementing



some major changes. The telecommunications system is changing, becoming primarily digital, and the old equipment is being replaced by sophisticated "smart systems." These new digital equipments are being energetically marketed by foreign equipment suppliers. The situation presents an opportunity for unprecedented penetration of the US national telecommunications system.

(U) DoD communications planners have traditionally not had to concern themselves with the problems and consequences of unrestrained foreign competition. Until recently, AT&T and its manufacturing subsidiary Western Electric handled the nation's telephone network equipment and planning requirements. Western Electric worked closely with the national security planners to ensure that certain minimum technical standards were maintained for the responsiveness of the system in the event of disaster or to satisfy mobilization requirements. The advent of the AT&T divestiture complicates this situation considerably by reducing AT&T (including Western Electric) to just another member in the field of telecommunications competitors. This field also includes, for the first time, a large number of economically aggressive and technically competent foreign competitors. Now policy planners must consider a number of new factors when evaluating the national security impact of foreign suppliers:

1. Will the foreign-manufactured equipments meet previously established standards for technical capability and quality? This raises another question: Should all equipment standards be published for the benefit of all competitors, even though in so doing we might be giving away information of value to military adversaries?
2. Will foreign suppliers have the capacity to resupply US emergency requirements? (Some national defense planners question their ability to do so.) Along this same line, would any foreign equipment supplier have the military capability or political will to support resupply efforts?
3. What about the national security concerns over the requirement for a foreign firm to maintain a mobilization base in the US to develop, manufacture, and maintain equipment in wartime?

(U) A recent case illustrates the defense concerns as they relate to the telecommunications equipment industry in the new, unregulated era. This case involved the installation of the first long-haul lightwave (fiber optic) cable. The first leg of this system

runs between New York and Washington, DC, with additional links planned to run north to Cambridge, Massachusetts and south to Richmond, Virginia.

(U) FCC approval was given to Bell to proceed with the initial New York-Washington line with the proviso that the system be procured through competitive bidding rather than by traditional implementation and procurement through Bell Labs/Western Electric. The FCC further ruled that performance requirements could not be specified in the bidding, only system design specifications. The FCC staff was concerned that performance requirements might give Western Electric an advantage over other competitors. However, the result was that requirements for the protection of the system against the effects of nuclear weapons and other defense considerations could not be included.

(U) In response to AT&T's call for bids, there were responses from two US firms (including Western Electric) and six foreign companies (including Fujitsu of Japan). The lowest bid was submitted by Fujitsu, which was in the process of being awarded the contract when the questions of national security were interjected. The national security concern led to the awarding of the contract to Western Electric.

(U) If this contract had been awarded to a foreign firm, it would have been the start of foreign encroachment into an area of critical importance to the US communications network. This is another instance of confusion and lack of coordination between Government elements. The FCC failed to consider the national security implications of carrying out its regulatory goals.

(U) The divestiture of AT&T and the deregulation of the telecommunications industry will create new problems and new opportunities for the national security telecommunications planners. Ironically, the result of this new competitive environment will call for increased Government collaboration with the telecommunications industry to ensure that national security and emergency preparedness interests are considered. The planning methodologies and relationships relied on in the past by the DoD are no longer possible in the new, competitive, post-divestiture era of telecommunications policy.

OOPS!



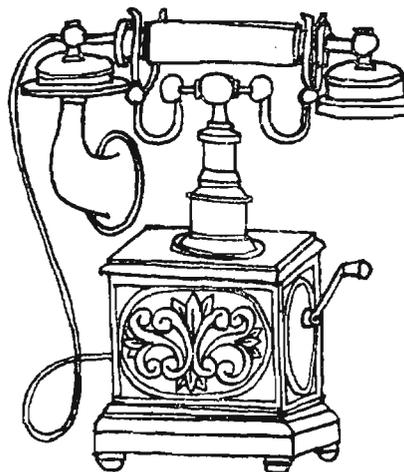
Correction

The article called "Suicide Shell" in CRYPTOLOG, May 1984, pp. 6-7 contains an error. Near the end of the second column on page 6, there was a line that read

5>1,\$s/^.*\$/mv & ../part2/

and should have read

5>1,\$s/^.*\$/mv & ..\part2/



Golden Oldie

QUALIFICATIONS OF A CRYPTANALYST (U)
 from Elements de Cryptographie
 by Capt. Roger Baudouin, 1939

translated from the French
 by Capt Albert E. Highley, A.U.S. [c 1945]



he history of cryptographic science teaches us that the "decipherer" (today we would say decrypter) has long been considered a kind of magician, a likely candidate for the stake.

Thus in 1595 when the mathematician Francois Viète, in the service of King Henry IV, imprudently boasted to the Venetian ambassador Giovanni Mocenigo that he had decrypted several despatches from the Spanish King, Phillip II, the latter complained vehemently to the Pope about it and accused France of "having the Devil and sorcerers in her pay."

Voltaire wrote in the article "Postes" in his philosophic dictionary, "those who would boast about decrypting a letter without knowledge of the contents thereof and without preliminary assistance are greater charlatans than those who would boast about understanding a language they have not learned."

This extraordinary idea of the "decrypter" seems to have persisted for a very long time. During the war of 1914-1918 Major Givierge, Chief of the Cipher Section at GHQ, will always be listed among the greatest masters of cryptographic science, was often called the "Sorcerer" by his comrades on the General Staff.

The reality about "decrypters" is very different. Cryptanalytic research, because it requires intellectual training and broad cultural background, is the achievement of an elite, but it does not to any degree depend upon magic or the art of divination. Although it is true that it requires special gifts of logic and intuition, it is also true to say that any cultivated mind can attempt it with a chance of success. Experience shows that many individuals who were unfamiliar with this discipline at first, have eventually become able cryptanalysts with brilliant successes as the result of work and private study, and with the assistance of only their own enlightened intelligence.

Above all the cryptanalyst--and this is an essential condition--must have an inclination

for research. The main attraction of cryptanalytic research--and those already familiar with this subject know how fascinating it can become--lies in the employment of sure logic and a disciplined imagination, based solidly upon well-founded technique, all employed in unveiling the secret of the cryptogram and conquering even the most ingenious artifices employed by the "enemy" for hiding his thoughts. In this silent battle between two intellects, the joy of discovery and the intellectual satisfaction that follows are an ample recompense for the trials and tribulations of the cryptanalyst.

A cryptanalyst needs many qualities. He must:

1. First, understand and grasp perfectly the mechanics of most classic systems of cryptography. This is the very root of his technique.
2. Show evidence of several mental qualities: clear judgment, logic, imagination, memory, ingenuity, perspicacity, intuition. Actually, experience shows that intuition, which some authors consider the prime attribute of the cryptanalyst, is considerably developed by practice.
3. Have some basic idea about the language to be studied. Although a fluent speaking knowledge is not indispensable, it is necessary to know well its characteristics, essential vocabulary, and fundamental rules of grammar and syntax.
4. Have patience capable of enduring any test. Cryptanalytic study involves long, fastidious research, a sometimes thankless and always wearisome task. Tenacity and obstinacy are indispensable to success.
5. Finally, know how to remain modest, to keep silent about achievements and to restrain boastfulness. In such matters it is easy to see that all considerations of self-esteem must be eliminated.

As one sees, the task of the cryptanalyst presupposes a broad cultural background and at the same time requires a combination of diverse intellectual abilities often hard to find. One might add that mathematical training, though not strictly indispensable, will nonetheless be a valuable help to the beginner.

By contrast to the many qualities needed to be a cryptanalyst, the materials necessary for cryptanalytics can be reduced to very few, essentially, cross-section paper, pencils and an eraser.

LINGUISTS AND OTHER MINORITIES (U)

P.L. 86-36



by



*I*n 1919 the United States Army sent Joseph Stilwell to the University of California at Berkeley for his first year of Chinese studies. He was slated to go to China as an attaché and later would lead Chinese and American forces against the Japanese in World War II. Stilwell had already mastered several languages and had served with distinction in liaison with our allies in World War I. At Berkeley he quickly realized he was wasting his time because "... there was no one to talk Chinese to after school." [1] He knew he would be better off transferring to China right away because there he could hear and practice the spoken language. He was a proven professional whose ideas should have received careful consideration. In fact, no one refuted his logic. Everyone agreed but no one took action on his recommendation. [2]

~~(C)~~ We tell ourselves that we've come a long way since then, but if we look closely at our governmental approach to foreign language training and application, this anecdote is uncomfortably familiar. Some SIGINT linguists have noted that they are expected to maintain current colloquial and technical proficiency in a language without having any contact with foreign nationals. Linguists and other professionals (such as security managers) really shouldn't be working at cross purposes. There are examples of how to do it right. The Government subscribes to large numbers of foreign newspapers and magazines so that linguists can have access to current materials without direct subscription. There are also recorded materials available, such as broad-

The author, who is now attached to CINCPACFLT CSG in Hawaii, wrote this article before leaving NSA in June 1984.

cast tapes. They are of great supplemental value, but hardly a substitute for two-way conversation. More importantly, they represent a compromise in which two groups of professionals came to understand each others' concerns.

(U) Before we talk very much more about who those linguists are what concerns them professionally, we had better take note of the fact that most Americans are not linguists. Most Americans, in government and out, are monolingual. Although this monolingualism is a relatively recent phenomenon in human history (the product of large nation states and means of mass communication, such as printing), it is the rule in modern America. By the sheer weight of their numbers, monolingual people will make most of the decisions effecting that specialized group--the linguists

~~(S-000)~~ A [presumably] monolingual American once wrote a letter to the editor of a news magazine complaining about the salaries paid to translators at the United Nations "... who only have to look up one word after another in a dictionary." An NSA manager once engaged in the following exchange with one of his senior linguists:

Senior Linguist: Sir, those new intercept positions are very complex. When we deploy the platform for an unexpected contingency, we can't expect linguists for the new target area to be able to cope with all this gear.

Manager: Then we'll use your linguists from the home base area.



Mgr: They don't need to tell us everything, just what's important.

(U) These two anecdotes are not intended to imply that most non-linguists are totally insensitive to the problems of translation. The ability to make an intelligent decision effecting subordinate specialists depends upon finding some way to appreciate the specialist's concerns and involving that specialist in the decision process. Many people automatically assume that because of his celibacy, a Catholic priest can never be a marriage counselor, and yet many of them are. They succeed by drawing from the experiences of married couples whom they have helped and they also consider their own experiences with interpersonal relations in the seminary and rectory. In the final analysis, the priest really doesn't make a "decision" anyway. What he does is help those married people involved to make their decision, guiding them as best he can toward a resolution that is healthy for the larger family and community. Empathy is never automatic, but it is also never out of reach.

(U) There is probably no such thing as a "typical" linguist in or outside the SIGINT community, but there are three main paths to becoming a SIGINT linguist:

- [] in the military;
- [] being a "native speaker" (i.e., a member of an immigrant family or growing up in a foreign country); and
- [] through academia.



~~(C)~~ Many linguists started out as youngsters from monolingual America who joined the Armed Forces and took a bunch of tests. They scored high on the language aptitude test which required them to discern patterns in an unfamiliar language. The easier versions are based on Esperanto, an artificial language in which the inventor wrote all the grammar rules first and then made up the words to fit the rules. Tests based on computer-generated artificial languages with realistically complex grammatical structures are more challenging.



(U) Having done well on the aptitude test, our young linguist-designate goes to language school and learns rote recognition of a limited and highly specialized vocabulary. This training is done very effectively. The academic community has always had the highest respect for the Defense Language Institute at Monterey, California--even in the 1960s and 70s when the defense establishment was none too popular on the campuses.

(U) The young SIGINT linguist is off to a good start, providing that the people he is working for understand that it is only a start. After several months on the job, with proper supervision and supplemental training, he will be an effective SIGINT linguist. Only if he broadens his own linguistic horizons on his own initiative will he ever be able to accompany the President as the interpreter on a state visit.

(U) A second path to becoming a SIGINT linguist is to be a "native speaker," either from an immigrant family or by growing up in a foreign country (e.g, the children of businessmen or missionaries). The immigrant family is one of the many benefits of our melting pot society because it literally takes a lifetime to acquire this type of language proficiency. Of course, the native speaker may find the specialized vocabulary of radiotelephone chatter to be totally obscure at first. A native speaker's vocabulary may also be archaic. One member of the large Hungarian community of Cleveland, Ohio, upon hearing the speech of the Hungarian "man in the street" for the first time, was surprised to hear an indigenous phrase for "rush hour." In Cleveland they had simply inserted the English words in a Magyar sentence. When her parents left Budapest in 1946, the phenomenon of "rush hour" did not exist there.

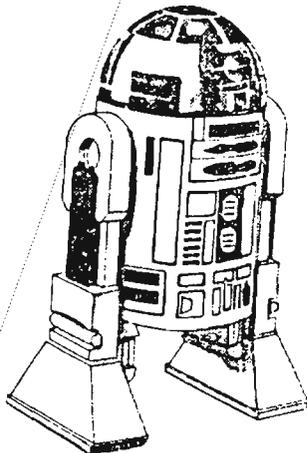
~~(C)~~ The third path is through academia. Persons trained at a college or university will often have a very solid background, although they will almost certainly have to strengthen their technical background to work as a SIGINT linguist. Those who majored in

the common western languages (German, French, Spanish) may be asked to cross-train in another language. Not only are the college-trained linguists already proven in their ability to learn, but certain combinations of languages are particularly useful

(C) When SIGINT linguists work as a team, the skills acquired on the various paths combine to strengthen the total effort.

- [] The native speaker may have initially felt he knew only "household" words but he can contribute to an understanding of the colloquial turn of phrase as no one else can.
- [] The academic linguist, having helped his professor grade papers for elementary language courses, may be thrown off by the kinds of usage common to soldiers talking on the radio. However, he will bring to the team an appreciation for the structure of the language and an ability to apply certain research skills.
- [] The experienced military linguist understands the operational context and peculiar jargon he has heard.

(C) Most of the managers in the chain of command above this team will probably not be linguists. However, most of them will be (1) smart, (2) well-intentioned, and (3) generally aware of the sorts of things we have been talking about. They were good at Traffic Analysis, or ELINT, or whatever or they wouldn't be managers now. They will know that their linguists are pros. Hopefully, they



will involve the linguists in the kinds of collection management, processing, and analytic decisions that affect them. The managers should encourage the linguists to work interactively with each other. They should encourage them to continue linguistic training and provide them with the necessary tools. They should also help them get the intelligence background they need, to include foreknowledge of friendly operations, so that linguists may see us through the eyes of others and recognize this for what it is.

(U) There are three common misconceptions that monolingual managers should avoid if they have linguists working for them.

(U) First, they should purge the word "fluent" from their vocabularies altogether. This is a very dangerous little word. Webster defines it as "ready or facile in speech." Most people seem to think fluency means that someone who is fluent in a stated language can understand anything that is said in that language and can render it into standard American English in the same length of time it took to utter the original phrase. It takes too long to acquire a working knowledge of a language to reduce the results to being either fluent or not. Much useful work can be done by people at various stages of proficiency.

(U) A second misconception is that linguists can soon be replaced by machines. Many popular science fiction works in print and on the screen have depicted automated translation systems. This has been a useful dramatic device. There is no need to explain the presence of an interpreter in the story. However, a fully automated voice-to-voice translation machine is about as far from reality as WARP drive and protocol droids. The two existing print-to-print systems are of very limited value. The machine translation projects currently under way are valuable for what they are teaching us. Researchers who abandoned the notion of fully automatic translation started to make real progress of immediate practical benefit in the distinct field of machine-assisted translation. [3] This gives a linguist the sorts of tools which have increased the efficiency of so many other white collar workers. There are now multilingual word processors, specialized magnetic dictionaries, and programs which will translate relatively unambiguous phrases and present them to the linguist for review.

(U) Finally, a monolingual manager should avoid the cliché that "it's easier to teach a professional _____ [fill in the blank] to speak a foreign language than it is to teach a linguist to be a professional _____ [ditto]." In some cases this may be true, but in other cases it may be

precisely the opposite that is true. A businessman, scientist, or military officer may study a language for a few months and then go to exchange ideas with his counterparts in another country. His fellow professionals will receive him warmly. They'll put up with mistakes and iron out misunderstandings. But extensive knowledge of a foreign language in a specified period of time, as the following story should illustrate.

(U) A US company once chose a promising young executive to run its operation in France. At great expense, the company contracted with a language school to tutor the executive and his wife. At the first session the teacher put a book on the table and said "le livre." The wife mimicked "le livre" beautifully. The husband croaked out something like "... leu leueueu ...". Two weeks later the wife was learning at a rapid pace and the husband was still stuck on "... leu leueueu ...". The husband and wife got a divorce and the company gave him a new assignment within their domestic division.



(U) The story of the US executive who couldn't learn French brings us back full circle to General Stilwell and his early Chinese training. Anyone can learn another language, albeit slowly and retaining a strong accent. However, many do not learn because the way we go about is so artificial. Our country is so big and our language so pervasive that we can easily get by without learning other languages. In most of North America, learning languages is left to a few specialists. In Europe, on the other hand, it is common for the majority of citizens in a country (especially in the smaller countries) to be multilingual. They become multilingual by daily contact with speakers of foreign languages. Given this context, being multilingual in North America is the normal state. For an individual, or for the nation as a whole, monol-

ingualism is probably a disadvantage for commerce and diplomacy. It does not have to be a debilitating problem if we take it into account.

(U) In a professional context, Americans who are linguists and Americans who are not must all consider language as a factor as much as automated data processing, logistics, and everything else. Linguists must realize how alien foreign-language considerations are to a largely monolingual clientele. Non-linguists must realize that they need qualified specialists and they must go through a selection and appraisal process, just as they would in getting medical or legal help. There are many examples from everyday life in government to show that some people on both sides of the issue do not understand these problems of human communication across language barriers (including linguists speaking to non-linguists in the same language). Hopefully, these realizations will grow along with the parallel realization that the world in all its diversity is getting smaller.

FOOTNOTES

1. Barbara Tuchman, Stilwell and the American Experience in China, pp. 62-4.
2. Ibid.
3. Professor Alan Melby of Brigham University at CLA presentation, January 1984.





1. INTRODUCTION

(U) This paper attempts to trace the events that thrust the space age first upon the United States and then upon SIGINT. It is very gratifying to have participated in--and perhaps influenced in some small way--both efforts. I believe that my closeness to the former led to my pressing for the latter.

(U) Before describing the actions themselves, I would like to give some background information on conditions that existed during the gestational years. Two or possibly three threads became interwoven to produce a nationally integrated space program. The first was rocket exploration of the upper atmosphere; the second, the International Geophysical Year; and the third, the rather bitter inter-service rivalry that then prevailed in this field.

2. US ROCKETRY 1948-1952

(U) My involvement with rocketry began in 1948, when Army Air Corps abolished its Watson Laboratories at Fort Monmouth, NJ. Most sections moved to Griffiss AFB, NY, and established the Rome Air Development Center. A smaller contingent was transferred to the Cambridge Field Station and, together with the Upper Air Laboratory already there, formed the Geophysics Research Directorate of the AF Cambridge Research Center (AFCRC).

(U) I was Chief of the Ionospheric Physics Laboratory, which was engaged in an intensive study of the upper atmosphere and its effects upon radio wave propagation. Our experimental investigations used ground-based or aircraft-borne instruments. The Upper Air Laboratory had overlapping interests and was involved with rocket-borne, in situ probings of the lower ionosphere. Thus, even though the experimentation was quite different, the objectives of the two laboratories overlapped and had much in common.

(U) Serious United States concern with rocketry had been sparked by the availability of captured German V2 rockets. In essence, after three decades of neglect, the US once again began to restudy the works of Goddard (US), reexamine the results of Tsiliokowsky (USSR), and learn the practical techniques of Von Braun (Germany). To obtain hands-on experience, the V2s were to be fired from the US Army rocket range at White Sands, New Mexico. Also, rather than fire them with ballast, the warheads were to contain instruments which could measure properties of the upper atmosphere.

(U) In 1948 the principal DoD groups concerned with rocket-borne exploration of the upper atmosphere were the Ballistic Missile Laboratory (BRL), the Naval Research Laboratory (NRL), and the Air Force Cambridge Research Center. Each service prepared and defended its own program and budget. Although they acted independently, they exchanged information through a V2 Rocket Research

Committee whose membership was limited and confined to the active groups and their respective contractors. Initially the launch vehicles were the V2s. Later rockets manufactured in the US (Wac Corporal, Honest John, Viking, Aerobee) were introduced.

(U) It was unfortunate, but true, that a considerable amount of tension existed between NRL and AFCRC. Marcus O'Day, Chief of the Upper Air Laboratory at AFCRC, and Homer Newell, head of the Rocket Sonde Section of NRL just were not simpatico. Both were knowledgeable, but they had completely distinct characters. O'Day was easy-going and casual and Newell more formal and rigid. Whether the friction arose from personality differences or organizational loyalties may never be known, but there was no doubt about the internecine warfare that existed between AFCRC and NRL. While I never knew how it originated, there was no doubt about its existence [1].

(U) The first few years witnessed both successes and failures. Many of the latter could be attributed to problems in the propulsion system (leading to unpredictable rocket behavior), unreliable telemetry, or experimental deficiencies. Some of these problems persisted into the 1960s.

3. THE INTERNATIONAL GEOPHYSICAL YEAR

(U) The International Geophysical Year (IGY) was an 18-month period (July 1957 to December 1958) during which most nations joined together for a detailed investigation of the planet as a whole. They recognized that national boundaries had no influence upon weather, ionospheric storminess, earthquake formation, tidal changes, etc., and that to better understand and predict these phenomena, a more thorough understanding of planetary physics was necessary [2].

(U) The International Council of Scientific Unions (an arm of the United Nations) endorsed Berkner's suggestion and invited all nations to participate. In response to this call, the US National Academy of Sciences established the US National Committee (USNC) for the IGY in 1953. I was appointed to the Committee and later was designated as Secretary and Secretary of its Executive Committee. I was also active on the scientific panels and lesser committees; e.g., the Ionospheric, Geomagnetic, and Rocketry Panels; chairman of the first two Antarctic Committees; and vice chairman of the Arctic Committee. These activities, of course, were in addition to my responsibilities at AFCRC.

(U) The USNC first sought to develop an internal US program in geophysics, and then to coordinate the program internationally to ensure that (a) international duplications were eliminated, and (b) gaps in coverage at national boundaries did not occur. All major nations joined the endeavor. The final program was truly global in nature. It incorporated studies on the continents and on the seas, in the Arctic and Antarctic, and it included rocket- and satellite-borne probings of the upper atmosphere.

4. INTERNATIONAL COOPERATION

(U) Although the USNC considered all aspects of geophysics, only those concerned with the upper atmosphere will be recounted here. The USNC Rocketry Panel contained many individuals on the old V2 Rocket Research Committee, now named the Upper Atmosphere Rocket Research Panel (UARRP). It also included active researchers not on UARRP, and thus was more broadly based. During early meetings the Panel confined itself primarily to experiments which essentially continued or improved already ongoing efforts. S. Fred Singer of the University of Maryland and James A. Van Allen of the University of Iowa expanded their "rockoon" (balloon-launched rockets) program for studying incoming extraterrestrial particles. Singer in 1962 published his MOUSE (Minimum Orbiting Unmanned Satellite, Earth). He brought this proposal to the attention of the Panel on Rocketry, but it was not endorsed [3].



(U) The first convocation of the Special Committee for the IGY, known as CSAGI from the initials of its French name, met in Rome, Italy, in 1954. It presented an opportunity to begin integrating the various national programs. The Secretary General of CSAGI, Marcel Nicolet of Belgium [4], asked me during the sessions, "When will MOUSE be ready?" I had

no suitable answer; the Technical Panel on Rocketry had not accepted it.

5. FALTERING FOOTSTEPS INTO SPACE

(U) Berkner forced a decision on US plans for launching satellites. He had brought his wife and daughter to the meetings and had a suite in the Hotel Majestic. One day he asked a number of us (including Joseph Kaplan, Hugh Odishaw, Harry Wexler, Wallace Joyce, Allan Shapley, Homer Newell, S. Fred Singer, John Adkins, Athelstan Spilhaus, and myself) to visit him that evening. After pleasantries he broached his concern: rumors were circulating that the Soviet Union was about to propose that CSAGI endorse the launching of earth satellites as an integral portion of the IGY program. Satellite-borne instrumentation would allow direct investigations of the upper atmosphere. Berkner wanted us to propose a US position. It was obvious that he was in favor.

(U) The discussions lasted well into the evening. It was quickly apparent that practically everyone present felt that the US should either independently propose, or join in proposing, the launch of earth satellites during the IGY. We all understood that such a stand committed the US to implementing scientific satellite experiments before the end of 1958 or shortly thereafter. However, it was the considered judgment of most that such a schedule was not unrealistic. Several of us had a working knowledge of the difficulties and problems affecting launches: thrust availability, costs, experimental possibilities, etc. Berkner himself was very familiar with the total US effort, including the progress in propulsion systems, and from a much higher level in Government than any of us.

(U) The lone serious holdout was Newell: there were no readily available boosters; solar cell outputs were too low; energy requirements could not be met; experiments could not be prepared in time; proven experiments were not at hand; the batteries would boil; etc. He stated that the US could not fabricate and launch an acceptable experiment in time, that the difficulties were too great, and that there were also doubts about Soviet capabilities. The rest of us felt comfortable about a positive stand for the US. The problem was not one of developing new technology or introducing untested theory; it was that of a modest expansion of existing technology.

(U) Finally Berkner asked for a vote. It was unanimous in favor: the US would propose incorporation of a satellite program within the IGY framework. With this decision in hand, Berkner, on behalf of the US, and Push-

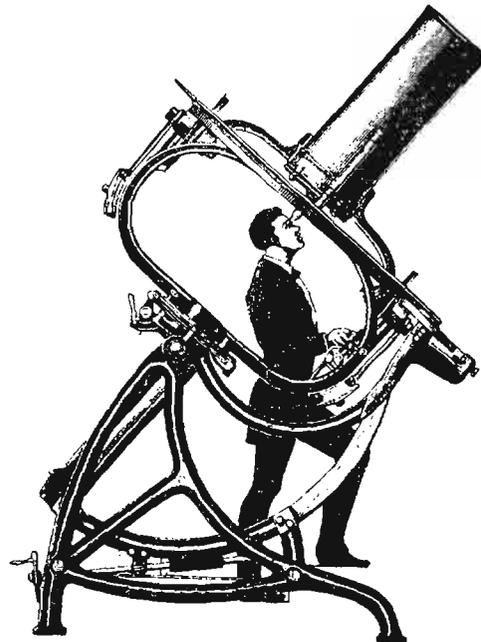
kov, on behalf of the USSR, jointly proposed that an earth satellite program be included in the IGY. The plenary session of CSAGI adopted this recommendation.

(U) Knowingly or unknowingly, man was about to leave the confines of his planet. Wittingly or unwittingly, consciously or unconsciously, a race had started. Most of us were too closely involved with details to anticipate the ramifications of our decision.

6. THE LURCHINGS OF GOVERNMENT

(U) After we returned to the US, the machinery of Government slowly began to clank. Berkner, who was on a first-name basis with the President, briefed Eisenhower. On July 29, 1955 the president publicly announced US participation. One day later, in a TV broadcast from the White House, Presidential Press Secretary James Haggerty, Spilhaus, and Shapley appeared on national TV to inform the public, explain the scientific implications, and clarify details. The Government now had formally committed itself to support the decision of our rump meeting.

(U) Deliberations within the Executive Committee of the USNC took an unexpected turn. Kaplan, the Chairman, termed the proposed satellite "the LPR" (long-playing rocket), and stated that the US effort would be wholly civilian in concept and fulfillment. Let the USSR use its military capabilities to launch a satellite for the civilian-scientific IGY; the US would not [5].

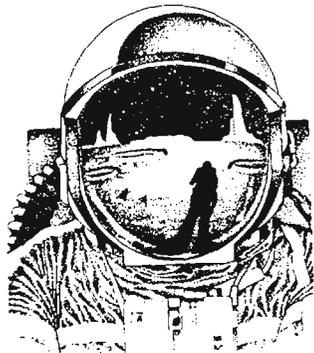


(U) I did not agree and privately pointed out contrary examples, most notably the US Antarctic program, supported solely by the US Navy, which provided all logistic and house-keeping support, transported the scientists and their equipment to the experimental site, and provided all facilities. Analogously, in the satellite case, DoD would logistically place the instrumentation in orbit, but the experiments themselves were to be scientific-civilian. If the USNC had not requested its own ships in support of the Antarctic endeavors or its own planes for the Arctic investigations, why should it request its own boosters for the space studies?

(U) Kaplan prevailed. The USNC found a surplus unused Vanguard rocket; it was refurbished to serve as a booster for the IGY satellite. The Technical Panel on Rocketry and Satellites considered its experimental possibilities. About this time rumors reached several of us on the USNC to the effect that the Army planned to launch a rocket which would "accidentally" attain earth orbit. I was later told, without substantiation, that Kaplan had objected and that, as a result, the Army was told to cease efforts toward this end.

7. REALITY AND ILLUSION

(U) As refurbishment of the Vanguard progressed, a meeting was held at the US National Academy of Sciences to discuss the satellite programs planned for the IGY. My invitation, in a telegram dated September 30, 1957, noted that the gathering constituted the international working party on rockets and satellites. Attendees consisted of delegates from the US and USSR. The press was represented. The Soviet delegation, led by Gen. Anatoly A. Blagonravov, invited us to a party at their Embassy on October 4, 1957. The meeting included papers on scientific and technical topics, which then were followed by discussion periods. Both nations outlined their scientific programs.



(U) In typical national fashion, the US provided much more information than it received. All Panel members were already familiar with many aspects of the US program, and we listened avidly to the Soviet presentations. In my view, two strong areas of disagreement crystallized during the deliberations. First, the US desired one common downlink telemetry frequency from the satellite at about 120 MHz. The US had chosen this frequency by happenstance; surplus military equipment suitable for downlink had been found and it operated at this frequency. The Soviets would not agree. Pushkov, who spoke English better than most of his colleagues, answered many of the questions. He was not convinced that 120 MHz was the best or only frequency to be utilized. Also high frequencies (HF) could be used and could provide some indication of refraction produced by the ionosphere. He patiently maintained his position. Discussions on this point were abandoned when it became apparent that the Soviets would not budge.

(U) A second point of discord occurred during the morning of October 4. It stemmed from US pressure for the Soviets to provide an official launch date for their IGY satellite. The Soviets were pushed rather relentlessly and intently--almost to the point of embarrassment. The replies were polite and courteous. Finally Pushkov, answering forcefully, stated that, "at the present state of the art, to predict the launch of a rocket is difficult and it becomes even more difficult to predict the launch of a satellite." There were too many uncertainties, too many things that could go wrong. Why state a date in advance when such doubt exists? He would prefer to provide a date after a successful launch.

(U) Richard Porter was the Chief US delegate at the meeting. I had wanted to discuss a number of topics with him and had decided to do so during the lunch break. However, the press reached him first and reporters crowded around him. I then sat behind and to his right and waited while the reporters held sway. It was interesting to hear his comments. While most questions were about the Soviets' prowess, progress, and competence, many also touched upon the reports presented during the Conference.

(U) Porter relished the attention, expressing himself freely and at some length while the pencils scribbled. The Soviets, he claimed, were "way behind the US"; there was no other possible explanation for their reticence in providing a launch date for their satellite. Their program must have run into extreme difficulties. They did not have the competence-- "Just listen to their answers!" (I shook my head in wonderment. How could two

knowledgeable individuals listen to the same technical discussions and arrive at such divergent views? If I had been engaged in research at MIT and a researcher in the same field from Harvard approached me, I would become vague if not mute. Furthermore, most of my colleagues would behave similarly: "The stalking cat does not purr.") On one occasion I was tempted to interrupt but thought otherwise and remained silent. Porter orated on.



(U) The sessions resumed that afternoon. Although I had an invitation for the party at the Soviet Embassy that evening, I had planned to miss it; it was a religious holiday and I would proceed home to Boston instead. Practically every other delegate attended. At the height of the festivities, Berkner received a telephone call: the "beep beep" of the 40-MHz signal radiated by the earth's first satellite, Sputnik 1, had been picked up. Berkner, I have been told, returned to the room, stood on a chair, clapped his hands, and publicly commended the USSR on its accomplishment. (The long-term US response, unfortunately, was weak: a burst of effort in the physical sciences that persisted for about one decade.)

(U) The USNC pursued its "open" space effort. The Vanguard was publicized and readied. The experiment was encapsulated and emplaced in the "bird." Complete television coverage took place during the day of launch to show the world that the US utilized only civilian-scientific talent in its space program. Unfortunately, Vanguard did not cooperate. Immediately after ignition it fell over and burned--with complete TV coverage. The US had learned a lesson. The Army was called in and asked to make the next launch attempt. Van Allen prepared new instrumentation for observing cosmic radiation (essentially a particle counter to measure the intensity of particles bombarding the earth). The satellite, named the Explorer, discovered the radiation belts that now bear Van Allen's name. The US had not been first in space, but its scientific efforts to date had been best--we had discovered a hitherto unknown major feature of the planet.

8. ONE NATIONAL EFFORT

(U) In 1956 I left AFCRC and joined the National Security Agency (NSA). However, I still participated in USNC activities. During this period NRL submitted a proposal to the Rocketry and Satellite Panel requesting post-IGY funding of specific experiments. The letter contained a "save us" plea--the Navy might not fund the program. I was rather dissatisfied with the contents for several reasons and finally wrote to the Chairman of the Panel. My letter, on USNC stationery, was typed in the old REMP-43 offices at the Naval Security Station. It treated three points. The first two aspects included (a) specific comments relative to the proposed experimentation and (b) questions as to whether the USNC should be the vehicle for post-IGY funding. It seemed to me that funding of this type was outside the intent and charter of the USNC and that the precedent that would be established would be unwise. The third topic opened the entire subject of one national space program for the US.

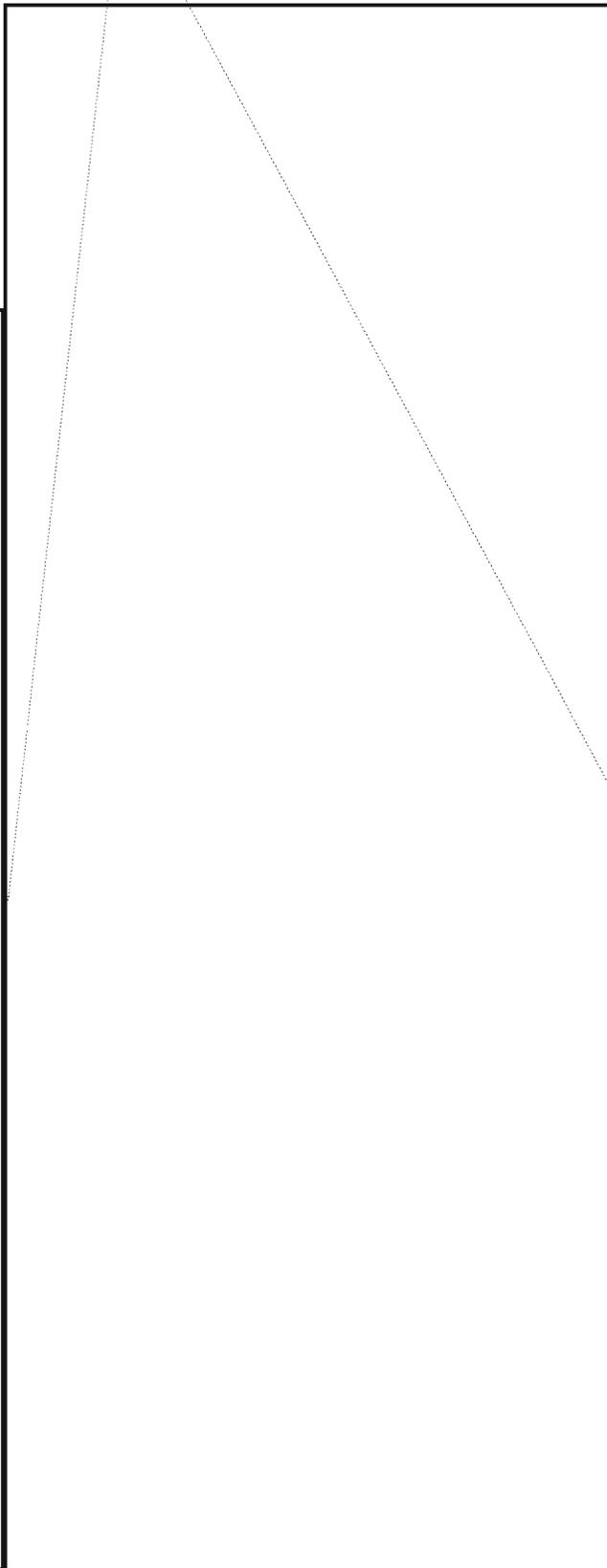
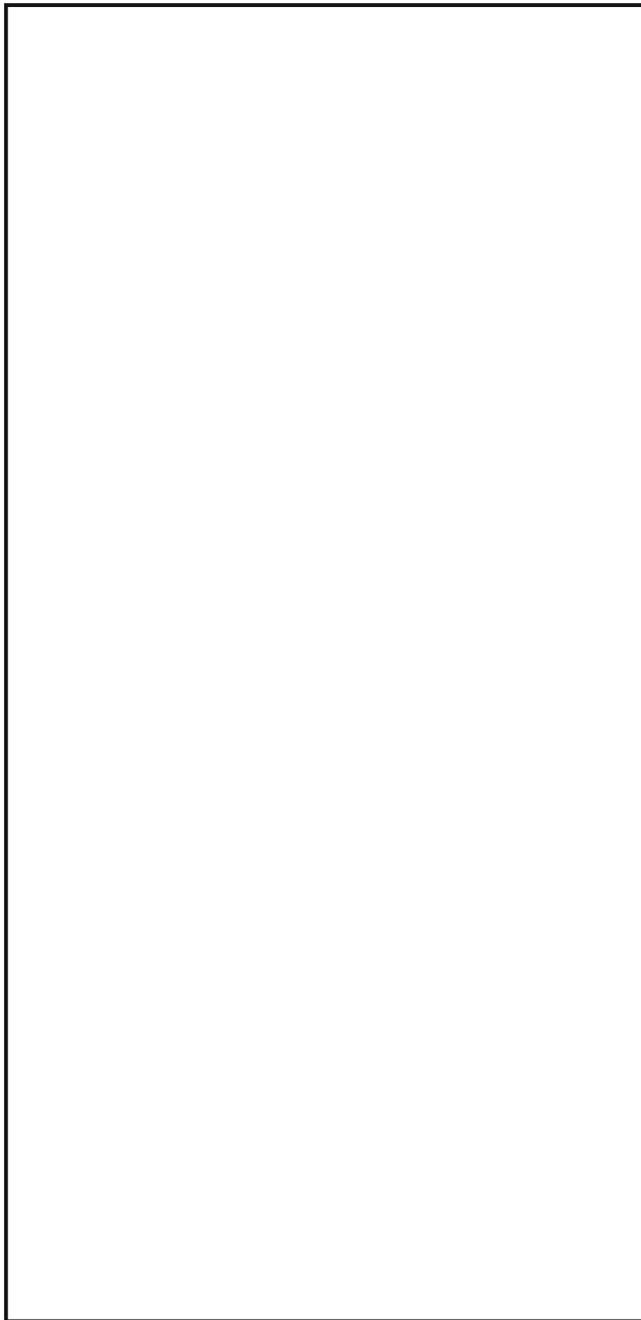
(U) The third aspect was probably the most important. What was the future role of US rocket and satellite explorations? I noted the long history of vicious backbiting in this area among the Services and suggested that this field be removed from DoD and placed in an independent Agency that pursued national objectives. Only an approach of this type would benefit the US as a whole. The present assignments within DoD did not and could not provide the healthy environment needed for progress. For the US to become competitive in the Space Age, a national focus was required.

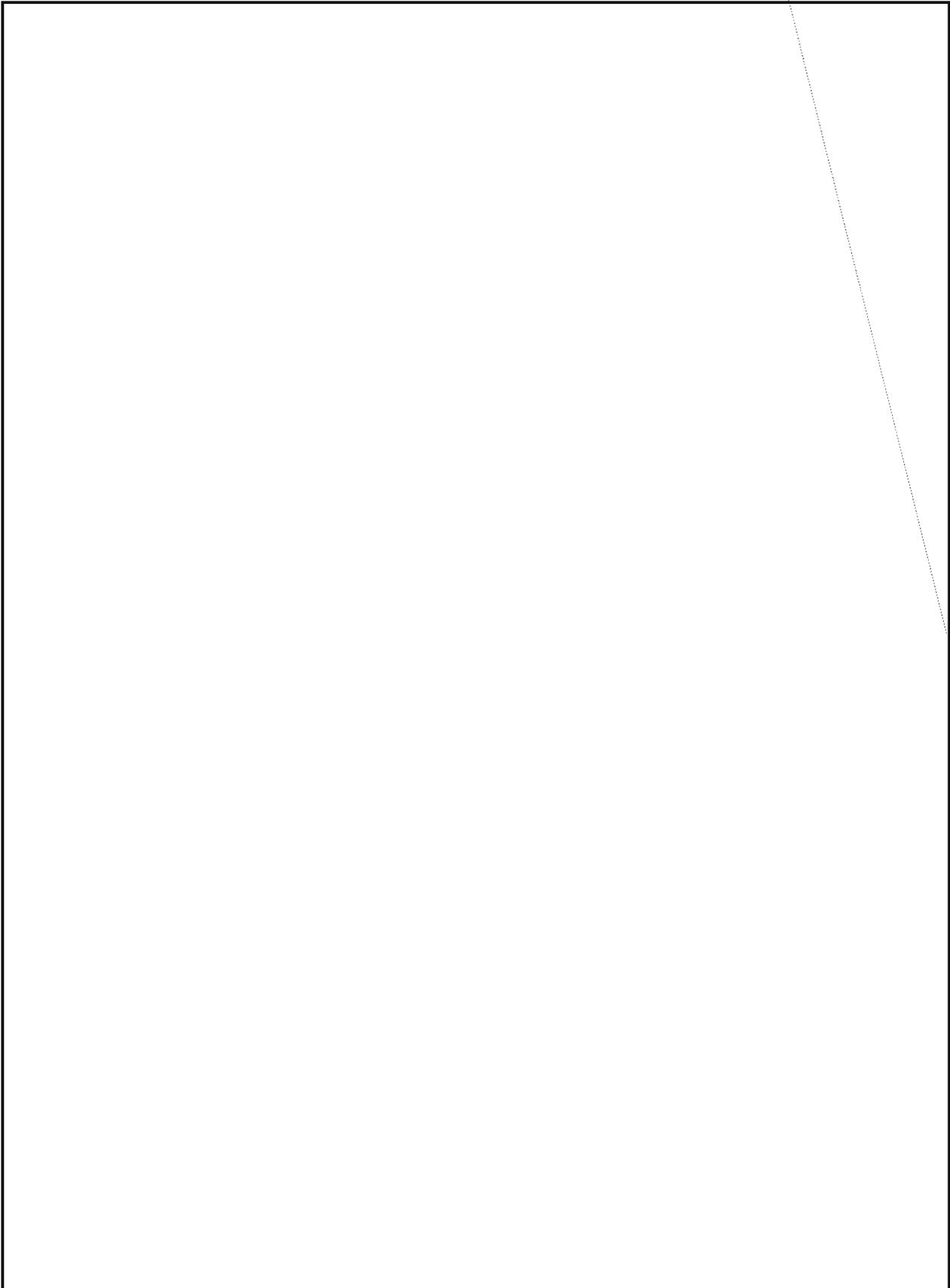
(U) I recommended that the future national program (to be defined) be housed within the National Administration for Civil Aeronautics (NACA). I had had many dealings with NACA previously and had worked with their personnel in the old NACA offices at DuPont Circle, Washington. (At that time I had been engaged in atmospheric thermodynamics.) I had been very impressed with the competence of the personnel and with their appreciation of research.

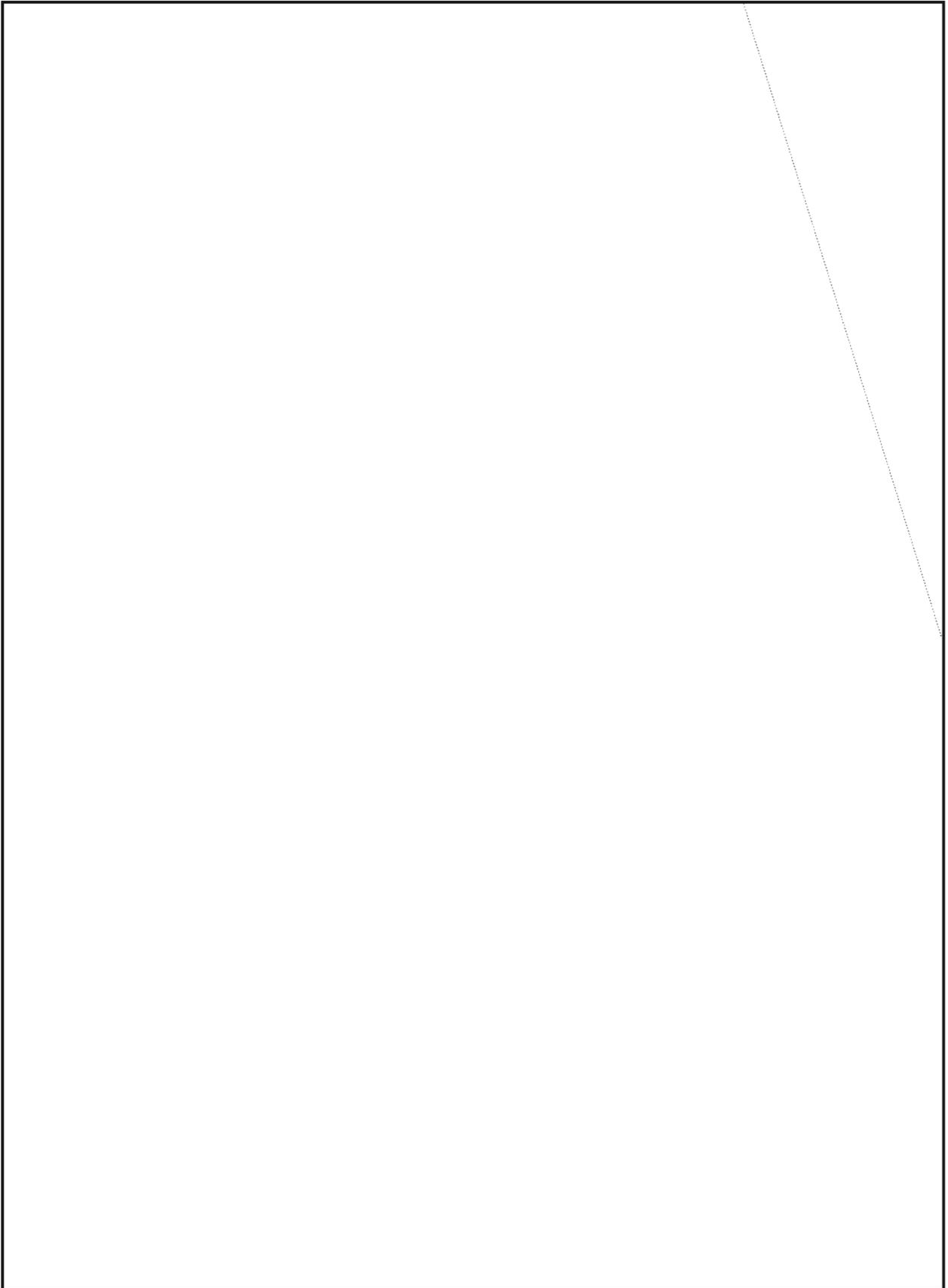
(U) Slowly my attention turned elsewhere--towards NSA. However, the results stemming from my letter were dramatic. A series of meetings occurred at various levels of government. Within two years the National Aeronautics and Space Administration (NASA) was formed. It absorbed the old NACA. NASA embraced a strong program that brought credit to the US.

9. SIGINT ENTERS SPACE

(U) For my part, I became more and more involved with problems affecting NSA and less and less with those involving the IGY. I had joined NSA in 1956 and Kaplan, after learning of this association, felt that I should leave the Committee. I subsequently resigned from both the full USNC and its Executive Committee in the summer of 1957. My attention turned towards applied research in SIGINT [6].







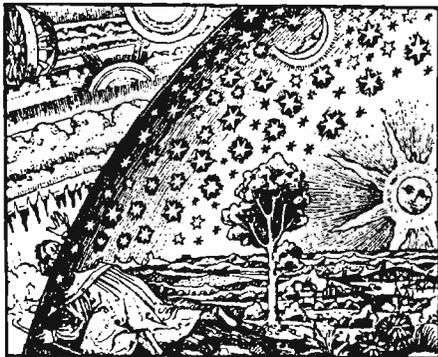
(U) The greatest problem was the small lunar gravity (one-sixth that of the earth) which would not allow retention of an earth-like atmosphere for any length of time. There were other problems: distilling the needed gases from lunar rocks, the thermodynamic properties of the atmosphere, and the warming of the dark side of the moon once an atmosphere was established.

(U) I cheerfully went ahead and assumed an atmosphere of 20% oxygen and 80% argon with a surface pressure about equal to that of Denver. (On the earth the composition at the surface is 21% oxygen, 78% nitrogen, and 1% argon. Argon was chosen as a potential filler gas for the moon because its molecular weight is much greater than that of nitrogen.) The thermodynamic properties of this atmosphere were curious, but the crucial unsurmountable obstacle was the loss of gas; the low gravity allowed the oxygen to "boil off" at an almost irreplaceable rate. Obviously, the answer is to utilize domed cities.

13. POSTLOGUE

(U) This paper has recounted many of the events that led NSA to its present course of action. It illustrates the thinking and problems at the time and the chain of events that led inexorably to our present concepts.

(U) From the vantage point of today, it seems clear that the research problems in physics facing the Agency lie in analysis and not in collection. Nevertheless, I fear that an adequate and viable program is lacking and that the Agency may be selling its future birthright for a mess of present pottage. We need new, stimulating ideas from competent researchers who know our problems. Where are the vibrant leaders? Spending money is not tantamount to ensuring progress.



FOOTNOTES

1. O'Day was particularly upset over an incident involving funding for a new Aero-bee vehicle. His proposal was at first approved by the Pentagon. NRL, however, greatly deprecated the effort (in favor of the NRL Viking rocket) and it was canceled. O'Day was correct: the Viking was an expensive white elephant that delayed the total DoD program for at least three years. He firmly believed that the NRL objective was to "seize control of the entire US space and rocketry program and shut out USAF." His numerous stories in this vein indicated that an unhealthy rivalry sapped the total US effort.

NASA's text Beyond the Atmosphere: The Early History of Space Science (1980) contains a number of allusions to this bitter friction but does not discuss them in detail. It omits many relevant contributions by other groups engaged in the early US space effort; in one instance it comments pejoratively on AFCRC.

2. The IGY was conceived by Lloyd V. Berkner, president of Associated Universities, Inc., Brookhaven, NY. Because of his accomplishments in fostering the IGY, I later suggested to Detlev Bronk, president of the National Academy of Sciences, that Berkner be nominated for a Nobel Peace Prize.

The IGY was a continuation of a series of Polar Years. The first Polar Year, held in 1872, was conceived by Karl Weyprecht, a lieutenant in the Austro-Hungarian Navy. It was followed 50 years later by the Second Polar Year. The objectives of both were extensive examinations of weather, auroras, geomagnetism, ice conditions, etc., in the Arctic and Antarctic. Berkner's proposed IGY shortened the period between Polar Years to 25 years and expanded their scope to include middle and low latitudes. In a survey of the Polar Years and the IGY, I questioned (in 1956) the need for future geophysical years since there currently existed a global network of active geophysical stations in constant operation.

3. Singer privately thought that NRL opposition caused the demise of MOUSE. NASA's publication Beyond the Atmosphere states that security classification muzzled discussion of this topic. If so, we at AFCRC had not been informed.
4. I had first met Nicolet when I invited him to a Conference on Ionospheric Physics that I sponsored at the Pennsylvania

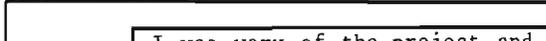
State College. Arthur Waynick of the Electrical Engineering Department and I then induced him to accept a research and teaching position at the College and conduct research on the physics and photochemistry of the ionosphere.

- 5. In Beyond the Atmosphere NASA contrasted the activities of the two nations by considering the space effort of the US as primarily open and scientific, and that of the USSR as primarily military. However, it is not possible to characterize them so neatly. Both nations designed realistic programs to accommodate their respective national interests in both defense and science. Furthermore, the long-term goals of one country were not materially different from those of the other. Thus, their objectives a priori included a mixture of military applications, national prestige items (lunar and planetary probes), and space research. Both nation realized that research represents vital national insurance for the future.

- 6. Within NSA I worked for Howard Campaigne, Chief of REMP, and John Crone, Chief of REMP-43. Initially I was involved with planning the program for the REMP College Park facility. One goal was laboratory studies which simulated ionospheric (low-pressure) conditions. Additionally, I worked very closely with Arthur Hausmann, Chief of RADE, and Robert O. Alde, RADE-3. I was extremely lucky on all counts. Better and more instructive teachers could not have been found.

- 7. 

- 8. About this time or slightly earlier, NRL had proposed construction of a massive steerable dish for moonbounce purposes. It would be capable of being steered to practically any area in the heavens and

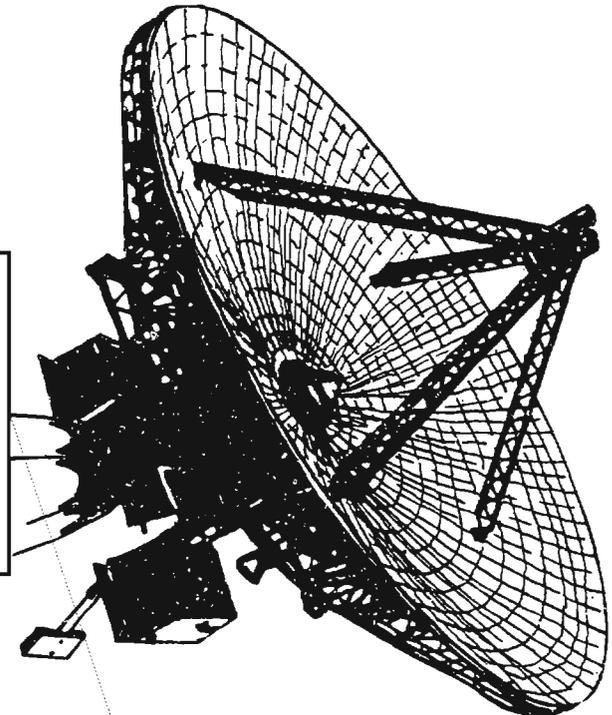
 I was wary of the project and recommended that NSA neither endorse it nor participate in it. It was subsequently plagued by cost overruns aggravated by further cost overruns, followed by discoveries of faulty design. Costs

rose from a modest amount to over \$600 million. Secretary of Defense Robert MacNamara finally canceled it. At a very early briefing, NSA was told that the dish was designed for scientific radioastronomical studies and that intercept was a by-product.



- 9. The dish at AIO has been updated considerably  Its surface now is spherical over its 300-meter radius to within 2 cm. It still remains one of the best radio telescopes the US ever constructed and, by any reasonable measure, probably the cheapest in relation to the research potential that it provides.

EO 1.4.(c)
P.L. 86-36



EO 1.4.(c)
P.L. 86-36

FROM CRYPTOLOG, VOL I, No.1
 =====

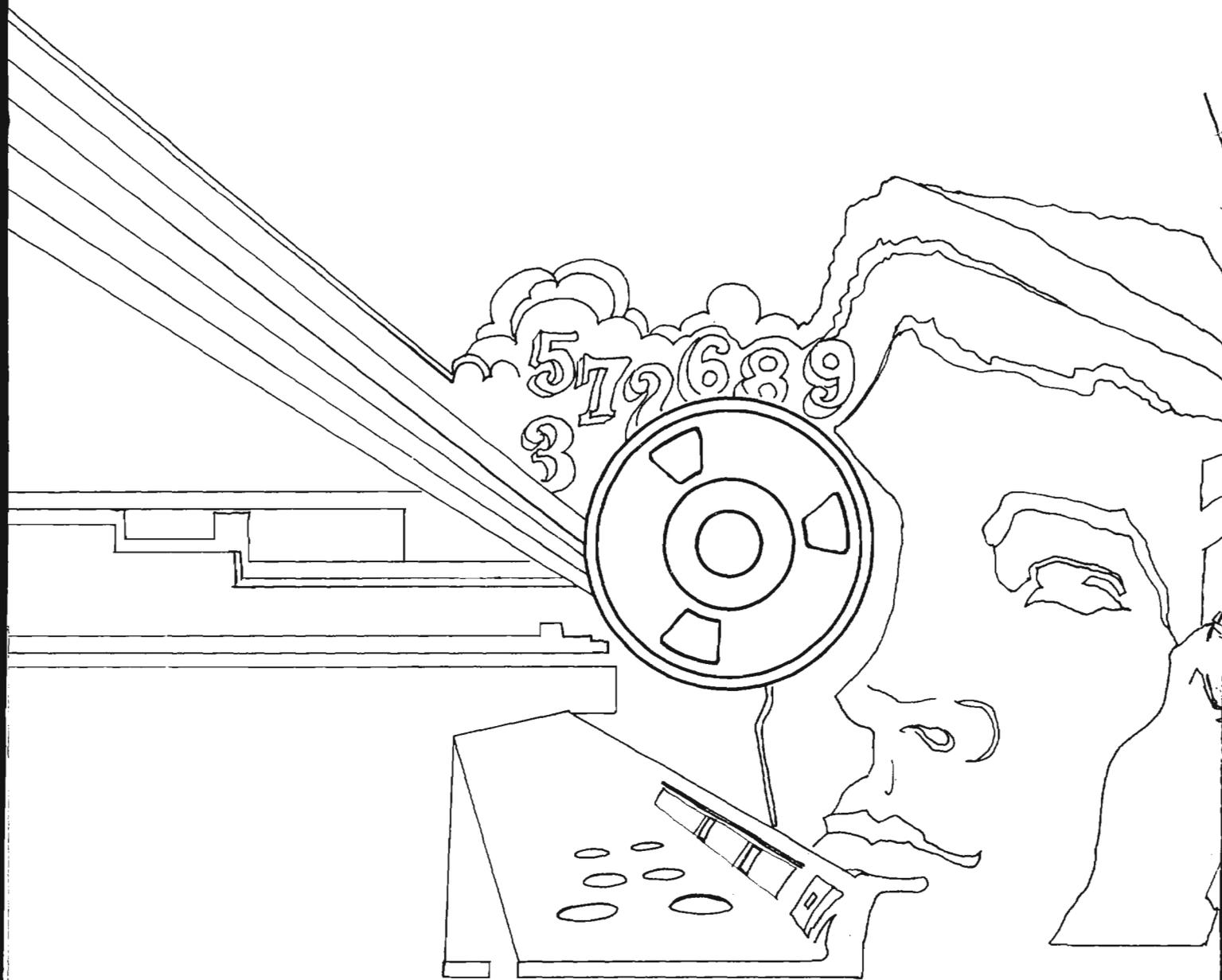
Solvers are reminded that when the answer to a definition contains more than one word, a remark to this effect is included in the definition.

NSA-Crostic No. 57

●	●	1	E	2	X	3	J	4	G	5	M	6	C	7	F	●	8	X	9	H	10	F	11	J	●	12	X	●	13	M	14	J	15	A			
16	D	17	X	18	C	19	G	20	E	21	R	22	F	●	23	J	24	X	25	F	26	E	27	C	28	G	●	29	J	30	L	●	31	J	32	F	
33	B	●	34	K	35	V	36	X	37	O	38	C	39	J	40	H	41	M	42	G	43	E	44	X	45	V	●	46	H	47	B	48	X	49	V	50	L
51	J	52	D	53	E	54	M	●	55	P	56	J	57	M	●	58	J	59	A	60	I	61	M	62	X	63	D	64	L	65	H	66	G	67	D	68	X
69	U	●	70	X	71	D	72	V	73	K	74	M	75	P	76	J	●	77	V	78	M	79	J	●	80	P	81	J	82	X	83	G	●	84	J		
85	O	86	P	87	G	●	88	J	89	X	90	F	91	O	92	T	93	S	94	V	●	95	S	96	X	97	N	98	Q	●	99	G	100	K	101	B	
102	I	103	X	104	J	105	M	●	106	J	107	X	●	108	X	109	O	●	110	J	111	B	112	S	113	X	114	J	●	115	U	116	V	117	L		
118	J	119	A	120	E	●	121	X	122	K	123	S	124	M	125	J	126	U	●	127	C	128	N	●	129	H	130	E	131	S	132	W	133	X	134	J	
135	M	●	136	X	137	D	138	A	●	139	X	140	F	141	W	●	142	J	143	N	144	K	145	G	●	146	X	147	W	148	N	149	R	150	J		
151	F	●	152	L	153	C	154	X	155	W	●	156	E	157	D	158	R	159	T	160	J	161	F	●	162	W	163	R	164	B	165	X	●	166	J		
167	Q	168	X	●	169	J	170	J	171	F	172	X	173	H	●	174	X	175	H	●	176	T	177	F	178	X	●	179	X	180	U	181	M	182	J		
183	F	184	W	185	S	●	186	G	187	S	188	F	189	X	●	190	H	191	T	192	X	193	G	194	V	195	S	196	J	197	Q	198	M	199	U	200	F
●	201	X	202	H	203	V	204	J	205	M	●	206	V	207	F	●	208	S	209	E	210	M	211	X	212	A	213	J	214	F	215	V		dhw	●		

- A. English county 138 119 212 59 15
- B. Anesthetic; upper regions of space 164 101 111 33 47
- C. Singer Snow; flycatcher 6 38 153 18 127 27
- D. Season in the Christian religious calendar; arrival 16 63 157 71 137 52

- E. Awe, profound respect
53 1 26 20 120 156 43 209 130
- F. Idea of the moment (4 wds)
214 140 10 188 200 32 22 207 171 25 7 177 183
151 90 161
- G. Type of high-interest investment fund (2 wds)
193 42 99 4 28 19 66 83 145 87 186
- H. Without mistakes (comp.)
190 9 129 46 65 175 40 202 173
- I. Ultimate, as of a degree
60 110 102
- J. "When ____": 1940 popular song commemorating an event which occurs annually on March 19th (6 wds)
31 170 134 23 142 14 160 125 56 169 51 182 84
11 79 118 39 3 204 106 81 58 196 88 213
76 166 114 150 104 29
- K. "Quinquiremes of Nineveh from distant ____" (*Cargoes*, Masefield)
100 34 122 73 144
- L. "Cherchez la ____."
30 64 117 152 50
- M. Movie (1947), TV series (1969—70) about a widow whose house is haunted by the ghost of its former owner (4 wds foll. *The*)
105 78 74 61 210 54 181 135 41 57 205 13 124 198 5
- N. On top of, above; finished
143 97 128 148
- O. Waiting room; pressure group
37 109 85 67 91
- P. Remove, as one's hat
75 86 80 55
- Q. Icelandic letter
98 197 167
- R. Granular snow
21 158 163 149
- S. By contrast, to the contrary (2 wds foll. "on the")
123 185 187 112 93 95 208 195 131
- T. Season in the Christian religious calendar; afforded
191 92 159 176
- U. English poet, 1572—1631
126 180 199 115 69
- V. Extinct marine reptile with a fish-like body, having fins and limbs
194 45 49 77 35 215 206 94 203 116 72
- W. Continent
141 132 184 162 147 155
- X. 1964 popular song
189 24 70 168 154 179 12 68 192 8 165 96 17
211 89 62 146 139 44 48 178 2 201 103 136
172 113 108 174 133 36 107 82 121



~~THIS DOCUMENT CONTAINS CODEWORD MATERIAL~~

~~TOP SECRET~~