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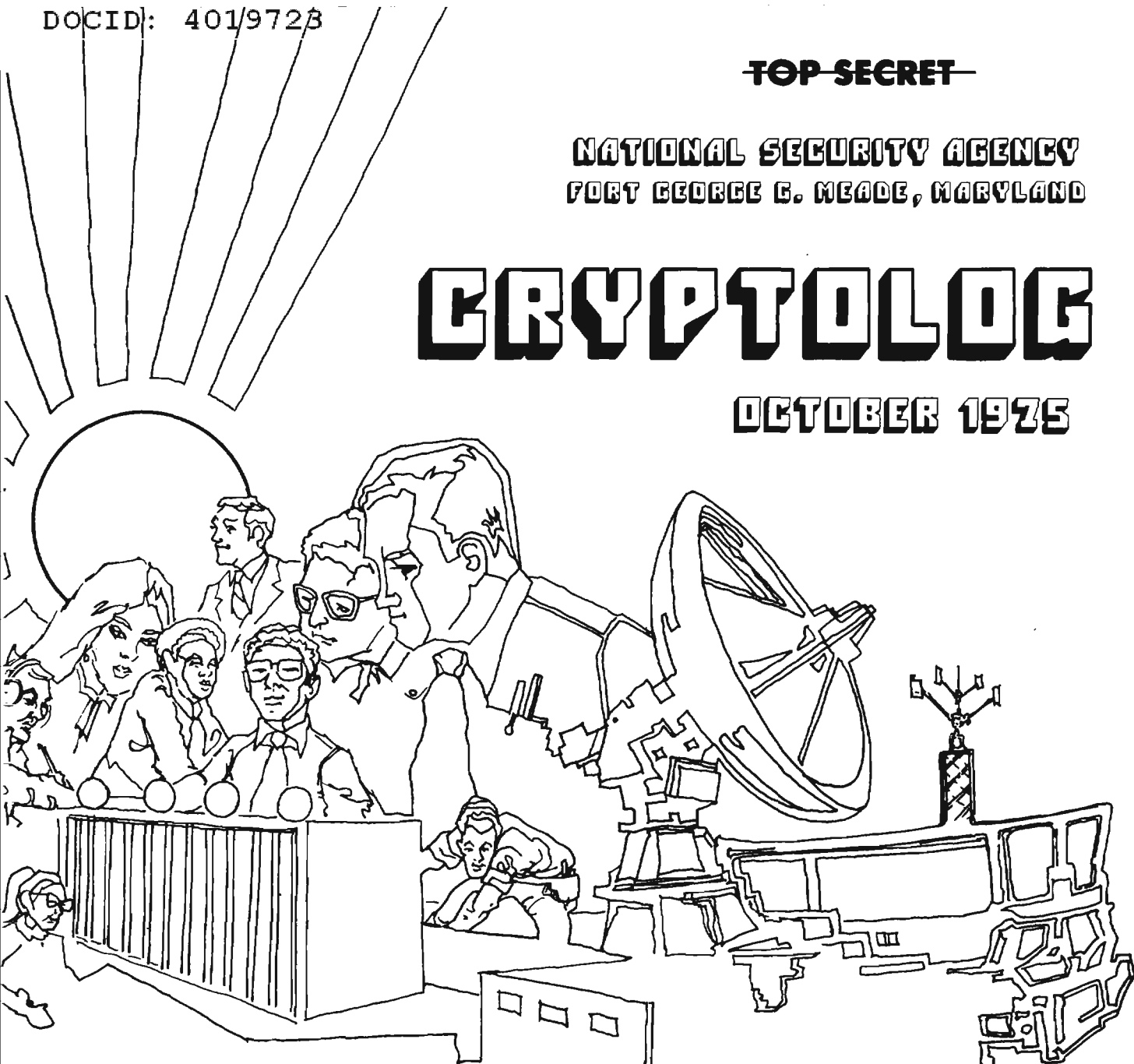
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CRYPTOLOG

OCTOBER 1975

SPECIAL ISSUE – VIETNAM

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CRYPTOLOG

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VIETNAM

Except for short features, this entire issue is devoted to the Vietnam War and its significance to NSA -- achievements, failures, lessons learned, problems unresolved. The intent is to record the personal impressions of NSAers while those impressions are still fresh, even if painful, so that they can serve as a guide for future NSAers. Because the emphasis is on the personal and subjective, there are slight overlaps in the treatment of the same topic by different authors and slight differences of opinion.

While the articles in this issue cover a wide range of topics, they obviously do not exhaust the subject. Therefore the Publisher and Editorial Board of CRYPTOLOG continue to invite contributions documenting the role of NSA in the Vietnam War. Any such contributions that are accepted for publication will appear in future issues of CRYPTOLOG.

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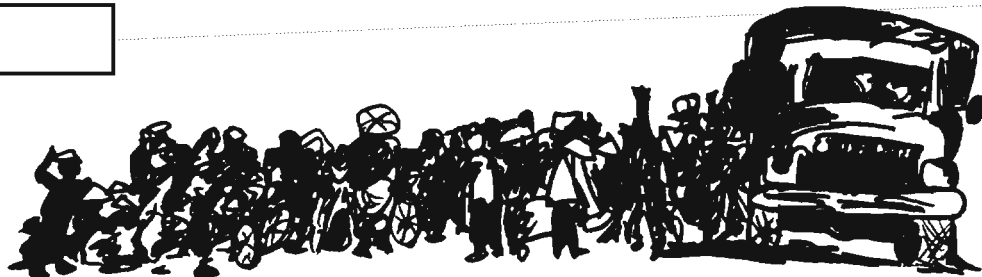
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NSA IN VIETNAM:
Proud and Bitter Memories

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One day toward the end of the Saigon nightmare -- I don't recall which day but it must have been 25 April or afterwards -- I decided to stop by to see Major ☐ while I made my rounds. There were only four NSA people left in Saigon, three communicators and myself, and so daily I went to pick up the intercept, ARDF results, and tech messages from the Vietnamese SIGINTers, and deliver tech support material to them, and also to bolster their flagging spirits. I didn't really have time to see ☐ ☐ but I liked and respected him more than any other Vietnamese officer I knew and I wanted to see how he was holding up.

Alone in his office, we talked quietly. He told me that USAID, where his wife worked, had offered to evacuate her along with her family. He said he could not bring himself to abandon his men, and he had urged her to take their two sons and go. She would not leave without him. He knew, he said, that his chances of escape at the end were slim. But he knew he could not live under communism. If Saigon fell and he could not escape, he would shoot his wife and children and turn the gun on himself.

On the morning of 29 April, I tried in vain to warn ☐ to pull out while he could, but I could not reach him. That afternoon, he telephoned another American, told him that he was still operating the Center with his forces intact, inquired what had happened to his commanders (they had disappeared), and asked if there were any chance that his family and he could escape.

He did not escape.

There are several reasons for repeating ☐ story. First, to convey the genuine tragedy of the end of Vietnam; second, to illustrate the nobility and calm courage the Vietnamese were capable of; and, finally, to underline quite deliberately the irony of much that was Vietnam, by making ☐ end the point of departure for relating the splendid things NSA did in Vietnam.

For all of us have every right to be extremely proud of the NSA role in Vietnam. Of all the stunning successes cryptology has achieved, none, in my opinion, reached the consistently superior level of our Vietnam effort over anything like so long a period of time. One reason for that success was the people NSA put on the problem. They were a gamy, imaginative lot, addicted to the problem, merciless to themselves in their drive for results, and given to puckish zaniness. The finest that I knew were those who were in Saigon up to the end, and my admiration for them is boundless.

All of these people have had to face the haunting moral question of involvement in Vietnam. The question is not escapable, and it is wrong to avoid it. I cannot honestly grapple effectively with the moral rectitude of U.S. military involvement in Vietnam, for my own involvement was not so much with war as it was with ☐ and people like him, my work, and my conviction that it is better to know the truth than not to know it. I believe that the job of intelligence is to discern and to tell the truth. Had we failed to tell the truth about Vietnam, we would be morally indictable. But we did tell the truth and often did it brilliantly. If much that happened was ugly, and if the ending was sad, then perhaps our trust in the wisdom and humanity of our decision-makers was misplaced; perhaps not. My personel bitterness over Vietnam does not extend to condemning them.

As will be eminently clear by now, what I am saying here is personal and subjective. I make no claim for the objective precision of my words, and still less for historical accuracy. I am less concerned with a recital of verifiable data than I am with sharing some of the feelings and memories that went with SIGINT in Vietnam.

NSA's presence in Vietnam goes back in my memory to 1958. During that time, and up until 1962, the problem was readable. The Viet Cong, operating clandestinely, communicated among

themselves in South Vietnam using _____

_____ Hence we were able to watch while Hanoi laid out her plans for the establishment of the National Liberation Front, named its officers, and dictated what its flag would be. We were able to report on the use of the Ho Chi Minh Trail for the infiltration of men and materiel, and to describe in some detail the maritime infiltration effort. All this in addition to detailed information on Communist Party activities throughout the country. _____

_____ Until 1964, we lived in a SIGINT desert except for the burgeoning ARDF effort which began to give us good locations on Party terminals. In 1963, if I recall correctly, SIGINT did its first spectacular prediction in Vietnam when it forewarned of the Communist buildup at Ap Bac.

In 1964, military communications were introduced into South Vietnam in profusion. Our TA effort and ARDF took on new importance as a tool to follow the North Vietnamese buildup in the south. The forerunners of the 5th and 9th Divisions, B3 Front, and Military Region Tri-Thien-Hue all appeared in late 1964 and early 1965. In late 1964, forces of roughly regimental size gathered in Phuoc Tuy Province, and again SIGINT foretold the attack before it happened. The pattern of successful prediction was established.

Through 1972, NSA succeeded in foretelling every major offensive that the Communists launched in South Vietnam. It was not that the target was so malleable; rather, the resources committed against it were monumental, and the analysts on the target had come to know it so well that they could almost smell an offensive coming. And they were faced with perennial problems: customer's failure to believe the foretelling, and customer's belief that the Vietnamese Communists were using communications deception and misleading the SIGINT community. More than once, lives were lost in converting users to believers in the SIGINT indicator system.

Meanwhile, we made some mistakes we came to regret seriously. We allowed some customers in Vietnam access to semitechnical communications information -- message volumes, contact logs, unidentified ARDF fixes. G2 and J2 briefings all over South Vietnam blossomed with graphs, charts, plotting systems, and mathematicians trying to find the magic relationship between message flow and the number of ARDF locations which, like the secret of the pyramids, could somehow shed divine light on the thinking of the Communists. I will never forget a particu-

larly painful exercise called "pattern analysis," whereby users plotted unidentified ARDF in hopes of discovering the ultimate truth -- something akin to the square root of the size of the enemy force divided by cumulative weight of all his heavy artillery (or something equally arcane). And then there was the lieutenant who told me that he had analyzed the RAD system used by the enemy and discovered a consistent relationship to the communications structure and first-heard dates.

The Vietnamese, with our help, had already gotten into the SIGINT business in the early 1960's. In 1963, one Lieutenant Colonel ___ ___ was put in charge of the effort. Among his early cadre were bright young lieutenants -- ___ who always reminded me of a caricature of a Japanese general from a World War II movie; ___ boyish and bright, married to one of the most beautiful women I have ever seen; ___ who had wanted to be a priest; and ___ who told his boss the truth whether he wanted to hear it or not.

But in those days the Americans had little time or interest in the stumbling Vietnamese COMINT effort. They were too concerned with their own SIGINT and its uses. As the sixties wore on, they found a way to intercept infiltration communications (GDRS) and keep track routinely of the movement of men into South Vietnam from the north. _____

_____ There was never much question in their minds from the communications point of view that North Vietnam was in command of the show in the south and that the distinction between VC and NVA (invented by the U.S. military) did not exist in the Vietnamese Communist mind. And despite the recalcitrant resistance of the target, our analysts were able to see through the communications and report the truth as it was happening.

In looking back, it seems to me that somewhere in the early 1970's the American people and their government made a tacit decision to let Vietnam fall if need be for the sake of ending U.S. involvement. That decision led to a thing called "Vietnamization," and in the SIGINT world, that meant getting the Vietnamese SIGINTers (known variously as the DGTS, J7/JGS, and SSTB) to a professional level instantly, a job as urgent as it was impossible. By 1973, the United States was intent on proclaiming the war at an end and Vietnam a thing of the past. The NSA effort on the problem was drastically reduced, and the job of NSA personnel in Saigon became primarily one of helping the Vietnamese COMINT effort to get on its feet quickly. As things progressed into 1974 -- when I arrived for the last time -- the irony of the situation was becoming palpable.

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TOP SECRET UMBRA

Congress was cutting back expenditures in Vietnam. Meanwhile, the North Vietnamese continued to build their forces in the south. The effort on Vietnam at NSA was reduced again. In July 1974, the Communists launched the Duc Duc-Thuong Duc campaign -- the first of magnitude in 10 years that had not been foretold by SIGINT.

The ironies multiplied as the situation worsened. A senior TDYer asked me what it was like to drive out in the country in Vietnam now that the war was over. We learned inadvertently that the Vietnamese COMINT organization in Danang was passing message volume figures and contact logs to the Commanding General, I Corps, who was keeping graphs and charts on them. In December, the Communists started the Phuoc Long Campaign -- again unforeseen in SIGINT. The province fell in January. Infiltration spiraled. We began to detect indicators that the reserve divisions in North Vietnam were preparing to move to South Vietnam. The Commanding General, II Corps expressed the opinion that the Communists were deceiving the SIGINT organization. I started a folk group in the local Catholic church.

By March 1975, it was clear that Congress was not going to provide funds to support the South Vietnamese military organization, which was accused of being corrupt and was utterly dependent for survival on the U.S. aid. The Vietnamese military began to waver in its self-assurance. Battles began to erupt around Pleiku in the highlands. I flew there on 7 March with to review Pleiku Center's status. Banmethuot fell several days later. The President of the Republic ordered a "strategic withdrawal" from Pleiku which ultimately turned into a grisly horror show with thousands fleeing in insane terror to the coast. I ordered our NSA representative to return to Saigon at once. He barely escaped. By mid-March the highlands were in the hands of the Communists. The highlands campaign had not been foretold.

By late March, we began to feel like players in a classic tragedy. Events developed with a relentless logic too pat to be real. Things that never happen in real life were happening, and Saigon took on the look of a sardonic nightmare. In a fit of hysteria, Hue and Danang fell, our man escaping by air at the last possible moment. The Vietnamese military began to crack seriously. Stories reached us of the monstrous bestiality that rose out of the panic in the north. We booked our wives and children on the earliest flights available out of the country, caring little where they went so long as they left Vietnam. At Easter Mass (30 March), my folk group sang about peace, brotherhood, and joy in the newness of life while NSA wives wept in the congregation and my daughter, on the altar beside me, forced back her tears. The following Friday one of the singers in the folk group died in the C5-A crash. The palace was bombed by a renegade VNAF pilot. We took NSA families into our office that day for protection. The city was rocketed.

Into early April, amid reports of panic and chaos in the military, we got the last of our families out and strained to get the work force out. Panic fluttered over Saigon. We closed down our houses and moved to a hotel for quick evacuation, should the end come with little warning. Tall, muscular young American men in civilian clothes and crew cuts appeared in the hallways of our building, muttering vulgarisms and Marine slang. Marine Colonel ▮, a long-time SIGINTer and Vietnam veteran many times over, flew in quietly from the 7th Fleet (anchored just out of sight) to confer on the evacuation plan and the SIGINT support to it.

Through all of this, the NSA employees still in Saigon astonished me. They knew perfectly well that they were in very real danger, from the Communists on the one side and from incipient panic in the city on the other. Yet they never faltered. They banded together to support one another, worked harder than ever before, and dug intelligence out of the Vietnamese COMINT organization. They kept communications open, scheduled departures, destroyed classified material, and shipped out whatever valuable machinery they could. Their endurance, drive, and raw courage were a testimony to me of what people are capable of in a disaster.

When we were finally down to 16 people, none wanted to leave. More than once I had to deliver a direct and blunt order to get an NSA employee on a plane out of the country. Each volunteered to stay in the place of another, unwilling to desert the Vietnamese or to leave the job unfinished. Weary to the point of giddiness, they pushed themselves on, knowing that what they did could give the forewarning necessary to save American lives and prepare the Vietnamese for the ending. Through small-arms attacks on the outskirts of the city and rocketing at random spots, they kept their gritty humor and their morale.

We were down to four when ▮ intercepts from COMBAT APPLE made it clear that the attack on Saigon was days away. The attack was to start at Tan Son Nhut -- where we were working -- and it would be a mixture of artillery fire and rockets. The timing was uncertain because the Communists were not sure how soon they could be in position.

Then it struck me that SIGINT was not being believed. The Embassy, it turned out, was of the opinion that the Communists were using communications deception to intimidate the Vietnamese. It was the final irony.

By that time we were down to three people. Then the attack came, as predicted. It began with a bombing from the air -- the first the Vietnamese Communists had ever attempted -- on the afternoon of 28 April. Small-arms fire began. The heavy artillery started after dark. Shells fell close to us and shook

[REDACTED]cations gear so much that I feared [REDACTED] might go out of commission.

The exchanges we had with NSA during those last days and especially on 28 and 29 April were edged with cynical humor. The Vietnam task force at NSA desperately wanted to help, but there was literally nothing they could do except to give us information. We were somewhat less than kindly to them and to others who talked to us then, partly because of our tiredness, partly because of our bitterness over the Embassy's communications-deception reaction, but principally because we were mavericks and were hard to live with, even in the smoothest of circumstances.

The three of us got out by helicopter on the 29th and then spent days on ships going nowhere, or so it seemed. The sudden enforced inactivity after so much concentrated work was perhaps the greatest hardship.

A handful of the Vietnamese we knew and had worked with for years escaped. Most, like [REDACTED] did not. That is the hardest thing we have to live with.

Now that we are all back in the world of staff coordination, triplicate forms, and being asked to comment on someone else's comments about what he thinks of commenting, it is clear that there was much about the ending that left bitterness in our mouths. But when I look back, I'm glad I was there for the ending. And as long as I live, I will be ever grateful and immoderately proud of the NSA people who were there, doing the best they could because it was worth doing.

VIETNAM ARTICLES IN

DRAGON SEEDS

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The following articles on Vietnam appeared in various issues of DRAGON SEEDS, the B technical periodical which was published from December 1971 through June 1974 (founder and managing editor, Mrs. Minnie Kenny, currently Chief, P16).

A complete set of DRAGON SEEDS is maintained in the P16 Cryptologic Library, Room 3W076, where copies may be read or borrowed. For information, call 4017s.

*Reprinted in this issue of CRYPTOLOG

Articles are not individually classified, but every issue of DRAGON SEEDS is classified TOP SECRET CODEWORD.

Classification of this listing is SECRET SPOKE

P.L. 86-36

1972-73: A VIETNAM ODYSSEY
[   ] and Edward A. O'Connor, F46

Approximately 125 kilometers SSW of Saigon, 4 hours by bus and 6½ hours by cycle, two tanks of gas by Honda, and 40 minutes by Air America "Gooney Bird," in Phong Dinh Province, Central Mekong Delta, lies the beautiful tropical splendor of Can Tho City and sanctuary/hideaway for IV Corps' ruthless, intrepid U.S. Advisory Team.

It was the Lunar Year of the Rat when the Odyssey began. The mission was to advise South Vietnamese Army (ARVN) personnel while they assumed the U.S. SIGINT mission in the delta from USM-607. Since there was no established precedence to follow, each problem encountered had to be dealt with in a unique manner. Realizing that extensive changes were essential to make the transfer of responsibility efficient, the first priority of the advisors was to circumvent the inherent language barrier and to establish a workable rapport with their ARVN counterparts. This was achieved, to some extent, through patient guidance and constant interface, i.e. sign language, graphic illustrations, etc. With such techniques at their disposal, advisors began to examine the innumerable problem areas.

Initial corrective efforts were directed at security procedures which were almost nonexistent. The following aberrations were rectified immediately: first, there was no ARVN officer on duty during weekends or holidays; second, an excess of defunct classified material was stored in file cabinets and boxes; third, and most important, ARVN personnel were not familiar with the use of the numerous incendiary devices for emergency destruction of crypto gear and classified documents. In addition, advisors established a picture badge identification system and access list for all authorized personnel. This list excluded one unidentified, indigenous individual who purportedly was employed by the 335th Radio Research (RR) company to guard the antenna field. (Can Tho Center's antenna field is located in a nonsecure area approximately 500 yards NE of the operations bunker.) Although the 335th RR Co departed, [   ] remained vigilant as ever, at the expense of an unknown source.

Concurrent with improving security practices, a program to extend manual morse intercept capability was implemented. Vietnamese operators had and were continuously receiving training in intercept techniques, but their proficiency was far below that of their U.S. predecessors. Specifically, their copying speed was approximately 8 words per minute, they could not backlink activity, and they were unaware of the effectiveness of morse operator characteristics analysis. After discussing these problems with the ARVN commanding officer (CO), advisors received permission to reorganize and supervise

the training program. The new program was successful enough, so that the supervision was eventually returned to the ARVNs. When new personnel arrived, they assumed their duties with a minimum amount of on-the-job training (OJT). However, after several months the operators, as well as other personnel, began to lose their incentive. To eliminate this negative attitude, the ARVN CO was convinced that a "Soldier of the Month" award should be initiated. This award consisted of 5,000 Piaster (provided by the advisors) and a Letter of Recognition. By U.S. standards the award was minimal, but the plot worked. The competitive spirit between sections increased; and following the first presentation, all personnel were striving to achieve the award.

The first award was presented to the Airborne Radio Direction Finding Ground-to-Air radio operator. Significantly, the ARDF tipoff function had undergone an extensive transformation and emerged from a state of chaos to the point of receiving special recognition. In fact, standard operating procedures were produced by this section and disseminated for employment throughout South Vietnam.

Following the cease-fire and associated withdrawal of American military personnel, the U6A ARDF aircraft assigned to the U.S. 146th Aviation Company were transferred to Saigon. Although four missions were tasked from Saigon daily, numerous problems occurred and approximately one mission per day was flown. Believing ARDF effectiveness could be increased with additional missions, advisors clamored for the assignment of ARDF aircraft at Can Tho Center (CTC) and the accompanying requirement for preparation of tech data lists (TDLs) for each mission. When four U6As were finally returned to Can Tho, the ARVNs did not possess the sophisticated, secure air-to-ground voice communications as American predecessors, and relied solely on the much slower process of one-time pads. Nevertheless, with Can Tho assuming control of the aircraft and providing mission tech data, ARDF results began to improve and personnel were instructed in methods of altering mission frag points to maintain greater cognizance on priority targets. As a result, more information was provided traffic analysts, enhancing development efforts.

In the early stages of the Vietnamization Improvement and Modernization (VIM) Program, there were only five analysts assigned to the TA section; two of them were radio operators for ARDF ground-to-air tipoff. The remaining three were required to devote all their time to preparing and transmitting daily TECSUMs. To increase productivity, five additional analysts were transferred to CTC, but they had only recently completed school and were unfamiliar

with operations. Complicating this situation, the new people spent almost 3 months painting, filling sandbags, and satisfying other administrative trivialities. When they were finally released to operations, their training was accelerated. In March 1973, the procedure for filing tech data was altered, a new system to handle unidentified entities was established, and the TECSUM format was revised to facilitate changes. Once analysts overcame their fear of error, development was successful and new entities were notated and forwarded as isolated.

Although positive results were being attained, a recurring difficulty plagued the TA sections --- the perplexing importance of serialization (NRs) and chatter extracts and the necessity for accurate logging of all entries to satisfy a computer, an alien wonder they had never seen but were told existed. In addition to the lack of experience and comprehension, only one traffic analyst spoke English and he was hospitalized with pneumonia for 3 months during this critical period. Instruction (pointing and drawing illustrations) was provided through non-analytic interpreters and with the limited operational Vietnamese of the advisors. After many hours of frustrating and occasionally humorous guidance (on the part of both advisors and ARVN personnel), periodic checks of the TECSUM and raw traffic indicated a continued improvement and a decreasing error rate.

Although results were favorable, there is no implication intended that the cryptanalytic effort was without its peculiar headaches. Numerous problems were experienced in couriering intercept from LLVI teams and from ASTDs when circuit outages occurred. Since the situation vacillated in direct relationship to the tactical environment, advisors were stymied in endeavors to alleviate this dilemma. Despite the requirement, air transportation (helicopter) was seldom available and courier by road was extremely hazardous. Yet LLVI teams attempted courier every 2 to 3 weeks and when necessary even traveled by bus in civilian clothes. Without any secure means available to transmit intercept for preparation of EMRs, these meth-.

ods were the only alternatives to satisfy demands for timeliness.

Although timeliness is an innate characteristic of the SIGINT mission, natural and man-made phenomena often alter the course of events. An excellent example was the selection of a location and construction of CTC's AN/TRD-23 medium-range direction-finding (MRDF) site. Between July and September each year, the tropical monsoons visit Can Tho. Again, field expediency dictates "Nothing shall be wasted" (to include monsoons); therefore, concurrent with the arrival of the monsoon was Can Tho's "Annual Aqua Festival." Although these festivals improved morale and helped solidify relations with the local inhabitants, the "Year of the Rat" proved to be the last of the Aquacade Follies. In May 1972 land surveyors from Engineer Region IV (ER-4) inspected the only possible location for Can Tho's proposed MRDF site, which unfortunately was one and the same as "Mini-Lake," where the festivals were held. The surveyors estimated that approximately 7,000 cubic meters of fill dirt would be required to displace and remove all the water from Mini-Lake so that a base for the site could begin.

All of these calculations led to numerous questions (not to mention where next year's Aqua Follies would be held): "Where would this amount of dirt be found?"; "Once found, how would it be transported to the proposed site?"; and, finally, "Who would finance the venture?".   EO 1.4.(c)

Because this MRDF site would be an integral P.L. 86-36 part of the ARVN MRDF net serving all of South Vietnam and would be manned by ARVN personnel, it was automatically assumed that the ARVNs would make all financial and building arrangements. After 2 months of ARVN procrastination, paper shuffling, and overall apparent apathy, the advisors decided to initiate some action. There were 2 weeks of rambling over the countryside in a jeep, over roads previously traveled only by reconnaissance teams. Then the advisors found a large "farm-like" residence, with an expanse of adjoining land. After several hours of verbal ping-pong, threats, shouts, obscenities, and finally handshakes, the advisors had bargained with the owner for the required amount of fill dirt. The nominal fee agreed upon was eight 55-gallon drums of gasoline (hopefully provided by Uncle Sam) and six cases of American beer (provided reluctantly by the advisors from their very limited personal cache).

The fill dirt dilemma was solved; transporting it from the farm to Mini-Lake was still another predicament. After several sociable evenings with members of the ER-4 team, the advisors were able to borrow several 5-ton trucks and one front-end loader to fill them. There were no operators available to run any of the machinery, so the ruthless, intrepid advisors began a trial-and-error fill dirt operation, that would have put Contee out of

business in a week. Anyway, 2 weeks and 184 truckloads later (overlooking hours of exasperation at the controls of the front-end loader, or back and vocal strain when trucks were "unprofessionally" backed too far into Mini-Lake and had to be "push-pulled" out), the base level was nearly workable. However, continuous rains along with the rising water table postponed any substantial achievements until early December 1972, when the earth finally dried up and initial work began on the installation of the TRD-23.

While operations were running as smoothly as could be expected at Mini-Lake, 500 meters to the northwest was another facet of the MRDF project. This was the location of the obsolete AN/TRD-4 site where some of the equipment for Mini-Lake had been stored. The removal of this equipment left only the hut, connecting cables, and antennas. By order of the Commander of Can Tho Airfield, a different section of perimeter grass was burned each month. As fate would have it, the date for burning grass in the area of the TRD-4 site coincided with the operation at Mini-Lake, and no advisors were available to monitor the burning. GIs from the airfield command trudged out early one morning to begin their detail. With gasoline cans and blow torches they began what was supposed to be a small, controlled, well-supervised grass fire. All went well for the first hour or so. Personnel were strategically placed, armed with shovels and rakes, just in case something should happen. An undetected slight change of wind (in velocity and direction), began to move the fire toward the AN/TRD-4 hut and its many antenna cables. Before anyone realized what was happening, the highly inflammable cables began to burn and spread toward the remaining antennas. This probably could have been stopped with a minimum of effort, if there had not been a war in progress. ARVN helicopters returning from a sweep and destroy mission, flying low over the airfield, fanned the flames in every direction at once, creating pandemonium and mass chaos. Before the fire could be brought under control, approximately $1,500 worth of cable, connectors, and antennas had been destroyed.

Meanwhile, back at Mini-Lake, to insure that future rains would not destroy the equipment installed for the TRD-23, everything was elevated one foot. This was accomplished by pouring concrete antenna pedestals (12" high) for each of the 26 antennas and two (12" thick) 12 x 18' slabs to support the generators and the TRD hut. All this was completed in 3 weeks, with most of the time being consumed scrounging cement and lumber for forms. Before any antennas could be placed on their respective pedestals, four perimeter poles (each 40' high) had to be erected in each of the four corners of the antenna array, with aircraft warning lights fixed to the top of each one. (This was necessary because Mini-Lake/TRD-23 site was only 200 feet from the end of the Can Tho Airfield run-

way.) As soon as the poles were in place the lights had to be operational; thus another project was temporarily halted until a power source could be found. The only generator in the area was owned by the Pacific Architects and Engineers (PA&E, also known as "Promises, Alibis, and Excuses"); so advisors approached them and obtained permission to use their generator. Yet another delay of 3 weeks was incurred because PA&E had another requirement to supply power for the Joint Military Commission (JMC) and the International Commission for Control and Supervision (ICSS) peace-keeping forces while they were at Can Tho Airfield. The delay came as a blessing. Checking their cable supply, the advisors discovered a shortage and the generator in question was approximately a quarter-mile away. After securing additional cable, the day finally came when the power was available. When the poles went up, the electrical cable was laid a quarter mile to the generator, the aircraft warning lights were working, and now the final installation of antennas could begin. Not 2 hours later, a Vietnamese garbage truck, making its daily run through the airfield, veered off the road, cut the electric cable just laid, and felled two of the 40-foot poles supporting the aircraft warning lights. Had the advisors not been pillars of virtue and possessed of great fortitude, this would have discouraged them. But, being ruthless, intrepid types, they had the cable spliced and the poles back in place in a matter of hours.

Finally, on St. Valentine's Day 1973, the metamorphosis of Mini-Lake was a reality and Can Tho's AN/TRD-23 MRDF site became operational. ARVN personnel, however, were not familiar with even the most basic maintenance procedures to support the site. Any outages that occurred were normally extended until TDY personnel from Saigon could diagnose the malfunction and acquire the necessary parts.

Inadequate maintenance capabilities not only plagued the MRDF site, but all facets of operations -- vehicles, generators, air conditioners, commo/signal-equipment, etc. Since CTC was only permitted to perform first-echelon maintenance, repairmen assigned received only limited training, as opposed to the extensive schooling afforded their U.S. predecessors. As a result of limitations, any equipment malfunctions usually had an extended adverse effect on the entire operation.

As at any other field station, Can Tho's nucleus was the communications center (CC). Without this equipment running smoothly, the station was cut off from the rest of the intelligence community.

Prior to January 1973, the CC at W33 (intercept designator for CTC) experienced many maintenance problems. Because of cramped working conditions, maintenance personnel could not perform daily preventive maintenance (PM), and this resulted in many operational hours lost.

Recognizing the "cracker box" problem, advisors suggested to higher headquarters (Unit 15 -- Saigon Center) that the CC at Can Tho be relocated to the area vacated by the U.S. CC. This move would facilitate the following: first, daily PM could be performed, thereby eliminating approximately 50% of equipment down-time; second, the addition of three new circuits (two with Saigon and one with the proposed 44th Support Platoon) could be accommodated; third, a significant amount of circuitry and equipment was left by the U.S. communications people, which would simplify the transition; fourth, the proposed area provided ample space to house all CC equipment and would also allow for further expansion should the need arise; and, finally, the new area had the much-needed direct air conditioning ducts to aid in keeping the equipment cool and operating. With Saigon's concurrence, the move was made and the CC began to run smoothly.

For any operations to run smoothly, constant supervision and guidance are necessary; therefore, every month the senior advisor accompanied the CO/CTC on his inspection tour to the three subordinate ASTDs. These trips provided an on-the-spot review of equipment, personnel, problems at hand, and any foreseeable problems could be discussed.

Transportation was always the fastest, best mechanically tuned jeep available at CTC, while the ARVN driver was a conglomerate of Andy Granatelli, Richard Petty, Bobby Unser, and Steve McQueen. This combination of driver and jeep was needed most on trips to the 7th ASTD, located in Dinh Tyong Province. To reach the 7th from My Tho City, a spine-tingling drive along Ambush Alley (a stretch of road approximately 1000 meters long, flanked by thick jungle on both sides) was necessary. This was where jeep, driver, and all occupants hoped for a new speed record on each and every trip.

These monthly sojourns into the VC/NVA occupied suburbs of the Mekong Delta also allowed for sampling of the local culinary/gastronomical delights offered at the many roadside stands. These stands are known by many pseudonyms: "Ba muoi ba" stands (named after the Vietnamese beer "33"), "Hepatitis stands" (named after "post-dinner complications"), and more commonly known to all as "the local Howard Johnsons." Inevitably upon their return to Can Tho, the ruthless, intrepid advisors proceeded post haste (usually with a gait reminiscent of that of the "Green Apple Quickstep") to the dispensary for a small white envelope humorously marked "Stopgap," or "Cement pills, for internal use only."

The successful transition from U.S. to ARVN COMINT operations has been evaluated and found satisfactory. The only unanimous regret, reflected by both ARVN and U.S. personnel involved, is that the VIM Program didn't begin earlier. Naturally, there is always room for improvement; but, keeping in mind the "newness" of the Vietnamese in the COMINT business, much credit must be given for their many accomplishments in such a short period of time. The advisors at Can Tho Center feel that the desire of the Vietnamese to constantly better the quality of their COMINT product will continue and enhance the overall Vietnamese Intelligence effort.

Authors' note: The preceding article only highlighted some of the achievements and humor associated with the Vietnamization Improvement and Modernization Program in IV Corps. To discuss the numerous anomalies and corrective actions that occurred on a daily basis would be cumbersome and would detract from the continuity of events. In reality, these daily occurrences often had the characteristics of the aimless wanderings of an odyssey and the futility of attacking windmills.

FRANCOPHONEGLOS ANNOUNCEMENT

Printout VI of FRANCOPHONEGLOS, PROD's computerized dictionary of the French language which is sponsored by G52, is now available for all eligible users. Although exactly the same size as the previous printout, this one has been made more compact by revision of the definitions and the withdrawal of Source 55SUPP (which has been amply replaced by the new two-volume Harrap's). It has been brought up to date including the new terms in the 1974 NATO Glossary and 5500 records derived from analysis of the French and English texts of the Official Journal of the European Communities.

Anyone having the necessary clearance and showing a need to know may request a copy of the printout from Barbara Dudley, 4814s, or [   ]4707s. Simple instructions for on-line-querying of the FRANCOPHONEGLOS are also available.

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(CONFIDENTIAL)

THE DO XA PADS
Edward S. Wiley, B441

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The Do Xa pad story began in the spring of 1963 in the last month before the onset of the monsoon season in Vietnam. Quang Ngai Province beyond the coastal enclaves was a contested area; the Viet Cong moved freely at night and avoided government forces during the day, unless they perceived a tactical advantage from ambush. As the end of the dry season approached, the commander of II Corps, General Nguyen Khanh, ordered a sweep of western Quang Ngai Province, including the region known as the Do Xa base area. The "Do Xa Operation" was launched on the morning of 6 May 1963 when ARVN elements of General Khanh's II Corps moved unchallenged into western Quang Ngai Province. By 12 May ARVN troops were less than 10 kilometers from the reported location of the Viet Cong's Intersector V command post. Airborne Radio Direction Finding (ARDF) aircraft had pinpointed the Intersector V radio station less than 2 kilometers from the position held by the ARVN on 12 May, but, as government troops moved through the Do Xa base area, the Intersector V radio station slipped away some 8 or 10 kilometers to the east.

On 13 May a company of South Vietnamese government forces holding a small sector in the Do Xa base area unearthed a watertight tin container weighing approximately 14 kilograms. Inside were more than a dozen packages of unused one-time key pads, all carefully wrapped in a rubberized sealant. An entire shipment of Viet Cong pads, buried in the soil of Do Xa, awaiting retrieval and distribution, had fallen into ARVN hands.

Word of the cache spread rapidly up the South Vietnamese chain of command, and the tin can and its prized contents were flown to General Khanh's headquarters in Pleiku. The opportunity for deception was obvious -- if. *If* the pads could be photographed and reburied without detection by the enemy and *if* the ARVN could hold their tactical position long enough to permit the pads to be duplicated. For if the ARVN held copies of the Do Xa pads, and if the Viet Cong eventually retrieved and used them, then the enemy's tactical communications would be readable throughout the life of the cryptographic materials.

General Khanh seized the moment. Within hours the shipment of pads was flown from II Corps headquarters in Pleiku to the Joint General Staff compound on the outskirts of Saigon. There the find was inventoried: ten packages of 50 pads each and four packages of six pads each -- a total of 720,000 groups of key.

Time was now the critical factor. American intelligence authorities in Saigon were alerted.

Representatives from the Military Assistance Command, the Central Intelligence Agency, the National Security Agency, and the Army Security Agency were on the scene at JGS headquarters on 14 May to examine the materials. It was obvious that quick action to copy the pads and restore the packaging for reburial at Do Xa would require American technology and experience, and the South Vietnamese could allow the Americans only 4 days to do the job. General Khanh insisted that he could not hold his position at Do Xa beyond Saturday, 18 May. The Americans agreed. They would go all out to copy the pads and return them to Khanh by 18 May. The task was staggering: some 36,000 pages of key to be photographed and all packaging restored to its original state. The undertaking far exceeded any capability existing in Saigon. The nearest U.S. installation with anything close to the necessary facilities [   ] The race was on.

The first step was to get the loaned cache of pads [   ] for a technical estimate of the feasibility of the task at hand. NSA insisted that first priority be given to copying the pads before their return to General Khanh. CIA and NSA agreed that if the job were beyond the capability [   ] the pads would immediately be flown to Washington. An officer from the NSA staff in Vietnam accompanied the pads on a midnight flight from Saigon to Clark Air Force Base in the Philippines, and at Clark a special aircraft was standing by to take the courier and pads [   ]

The initial reaction of the [   ] was far from encouraging. Only one [   ] man was at the station; even working around the clock for 3 days, he could not enter and reseal all the packages. Time was by then too short to consider sending the material on to Washington. Whatever was to be done would have to be done [   ] At NSA's continued urging, photocopying the pads was to be accomplished first. Deception became a secondary concern. The seals on the packages were entered and the photographing began.

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Time was short.

Everything now hinged on time. The [redacted] technicians were pressing [redacted] for an extension of the 18 May deadline. Some room for optimism was reflected in an NSA message from Saigon: "In regards to deadline of 18 May, this is still the date we must have pads back. There exists a possibility that we might obtain a few days extension if Gen Khanh will hold present position in field...." This optimism was reinforced by a JSPC message to the NSA office in Saigon a few hours later: [redacted] had extensive correspondence with [redacted] and they think they have an extension until 22 May." Then the bubble burst. From the NSA representative in Vietnam came the following message: "General Harkins has approved sending complete package of crypto material via courier from JSPC to NSA. Stop any further reproduction of material ... tactical troops withdrawing...evidently result of someone trying to change our deadline from 18 May to 22 May, which cannot be approved due to tactical plans." A later message added, "...coordination was not completed throughout ARVN on the date of 22 May. Within a few hours troops had started to partially withdraw from terrain presently held. Since this was the situation our plan to rebury material went down the drain."

[redacted] technicians at [redacted] continued to work on the Do Xa pads. By the morning of 17 May, with the original deadline only hours away, JSPC cabled Saigon and Washington, [redacted] did not stop work on materials. [redacted] has been in touch with [redacted] and their word is that chance of returning materials to cache is still possible. Present plans are to have all materials photographed and original pads returned to very nearly original state.

Plane is being held to depart for Saigon between 1200 and 1400 hours 17 May. Materials will be ready to attempt deception." By return message the NSA office in Saigon advised, "Latest information, as of 1000 hours local time the original plan is being carried out. Material will be in Saigon on schedule. Troops are holding terrain for one more day to complete original plan."

Success was within reach. The Do Xa pads had been copied and the original packaging reconstituted. The entire cache was flown to Saigon, arriving at 2115 hours on the evening of 17 May. CIA and NSA representatives inspected the refurbishing job, and the tin container was soldered shut. Shortly before dawn on 18 May, the Do Xa pads were delivered to Pleiku. A few hours later, as ARVN troops stood guard, a CIA officer from Saigon buried the metal cannister in the soft earth and covered the spot to disguise the intrusion. Under the mid-morning sun, the ARVN forces began to withdraw from the Do Xa base area. The long wait had begun.

Because Viet Cong radio stations often returned to previously held locations after moving to avoid ARVN sweep operations, ARDF aircraft closely monitored events around Do Xa after 18 May. An airborne fix of 12 June showed that the Intersector V radio station had moved back to within 2 kilometers of its location prior to initiation of the "Do Xa Operation." Expectations rose at NSA. Perhaps the buried pads were about to be retrieved and used. The watch over events at Do Xa continued.

Meanwhile, the film of the Do Xa pads was flown on to Washington [redacted] Prints reached NSA headquarters on 25 May. Computer programs to match the recovered key with cipher text were written, and the material was speedily collated, sorted, and assembled. According to NSA's analysis, the Do Xa pads had probably been prepared for distribution some time before their discovery -- they had been wrapped in Viet Cong newspapers dated May 1961. Further examination suggested that the Nam Bo Regional Committee had been responsible for forwarding these cryptographic materials to their destination. By 5 July, NSA was able to report the identity of some intended recipients of the Do Xa pads: "Some pads and series of pads designed for use between Hanoi and Saigon/Cholon Special Sector. No known link between them."

All intercepted Vietnamese Communist radio traffic was checked for evidence that the Do Xa pads had been retrieved and used. Results were negative.

Somewhere out in the western reaches of Quang Ngai Province in Vietnam a cannister of unused one-time pads lies buried in the moist earth, undisturbed by the events of more than a decade and unknown save to a few who recall those hectic days of May 1963.

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LANGUAGE LESSONS LEARNED:
A Personal Memoir

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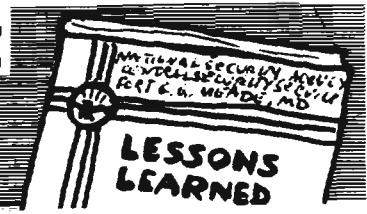
It was a typically hot and humid day in Saigon when our jeep pulled up at the building that housed Headquarters, Military Assistance Command Vietnam (MACV). But it was not the humidity that made me uncomfortable. The purpose of my visit to the "nerve center" of the U.S. military establishment in Vietnam was, judged by the standards of the day, deceptively simple. Convinced that obstacles were awaiting me, but fortified by the thought, "The older I get, the less I have to lose," I entered the building.

At the time I was working with the linguists at USM-626 on the analysis, translation, and reporting of Vietnamese Communist (VC) military operational traffic

The obvious source of such information was MACV. At that time NSA had a small liaison element at MACV. After a brief stop there, a couple of phone calls, and a guided tour through a labyrinthine complex of corridors, I found myself inside a human beehive known as the Combat Operations Center. Documents galore, wall-to-wall sliding maps, briefing charts, blackboards, and strategically placed desk officers who were responsible for specific areas of the country. I explained our requirements to the desk officer in our area of interest, and in a short while I had in my possession copies of the U.S./ARVN Disposition of Forces and other relevant documents. It was then that the desk officer showed me a MACV publication entitled *LESSONS LEARNED*. It turned out that after every tactical operation the platoon leader, company or battalion commander, or other person in command would prepare a detailed report -- a kind of postmortem -- of the operation, outlining the problems encountered, the results achieved, and, of course, the "lessons learned."

I do not know the fate of that unpretentious publication with the eyecatching title, but I have never forgotten it. Since the SIGINT industry, like any other field of human endeavor, progresses on a "building block" basis -- one generation profiting from the successes and failures, the trials and errors of the preceding one -- I have often wondered how an NSA publication entitled *LESSONS LEARNED* would be received. Suffice it to say that if there were one, I doubt whether any of us could resist the temptation to take a peek inside!

In any event, after 20-plus years of involvement in SIGINT Vietnamese language problems, I am convinced that there are more than a few lessons to be learned from our experiences. My conclusions, obviously, are based on my personal vantage point and, as the saying goes, "do not necessarily reflect the views of the management."

"Could We Have Done Better?"

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The expression "the language problem" inevitably creates in the mind of the listener or reader a negative image -- insufficient numbers of linguists, insufficient skill levels of linguists, inadequate training, insufficient effectiveness in job performance, etc. But in the language field, as in any human endeavor, there is also a positive side to the coin, which we often tend to forget or at least do not stress. So, before we ask "Could we have done better in the SIGINT Vietnamese language effort?", let's stress the positive. That's easy to do. Vietnamese linguists, civilian and military, made an enormous contribution to the National SIGINT effort. That contribution is not yet chronicled, but it is nonetheless well documented. The repositories can yield mountains of evidence

that the linguist played a central role in the SIGINT production process. Untold numbers of unsung and unheralded linguists met the challenges of the time with high dedication and exceptional talent. Therefore we mean them no disrespect when we ask ourselves, "Could we have done better?" or when I answer that question with a resounding "Yes!"

The language function, to use an expression of a local sports commentator, is really "a very simple game." (I might add at this point that my focus is on the translation-transcription world and not the cryptolinguistic arena, where

the word "simple" may raise some eyebrows.) All the linguist has to do is determine:

a) the content of the message or the voice transmission;
b) its intelligence value, if any; and
c) the appropriate vehicle for reporting the information.

The development of linguists to accomplish "a" was a far more formidable task than to produce those skilled in "b" and "c". It was precisely there that most of our language headaches originated.

One of the foremost linguists in the Agency, during a conversation in which I was agonizing over the problems we were having in developing a cadre of skilled linguists, said, "The language problem is 98% managerial and 2% technical." I was astounded at that remark and was inclined to pass it off as a humorous hyperbole. With the passage of time, however, the truth and the wisdom of that observation became all too clear to me. Virtually all the languages we have to deal with are fairly well documented. There are, of course, exceptions, such as parts of sub-Saharan Africa and Asia. The Vietnamese language, however, is *not* one of the exceptions and, in essence, the "technical difficulty is in ourselves and not in the set."

Linguistic Quality Control

If I were asked to name the most serious flaw in the Vietnamese language effort, I would unhesitatingly point to the training and development of linguists. If I were asked to state what main ingredient was missing in the recipe, I would unhesitatingly say *quality control*.

What does quality control connote in this context? Well, for openers, let's take a look at Webster's definition: "the aggregate of functions designed to insure adequate quality in manufactured products by initial critical study of engineering design, materials, processes, equipment, and workmanship followed by periodic inspection and analysis of the results of inspection to determine causes for defects and by removal of such causes."

As we gradually moved from the role of interested observer watching the French chase the Viet Minh all over the countryside with consummate lack of success to that of active participant when *we* took over the chase with equal frustration (by this time it was the Viet Cong -- which means "Vietnamese Communist" and which the RVN applied to all communists, north or south), the pressures on the SIGINT community understandably became more intense.
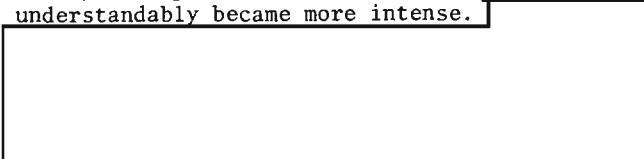
It is part of our national psychology to "think big" -- assembly line production, "massive retaliation," "cheaper by the dozen," etc. So, faced with a problem of immense proportions, the logical move was to respond in kind. If we can produce rifle parts on an assembly line, then we can produce Vietnamese linguists on the same scale and at the same pace, right? Wrong! There were *far too many* linguists with *far too little* language ability. The most worrisome effect of this phenomenon was not the squandering of resources -- as bad as that was -- but the increased hazard of providing customers with inaccurate SIGINT, which, of course, is worse than no SIGINT at all. This problem of linguist training and development plagued us to the very end of the war. Why? The answer, in large part, was the lack of effective quality control from the "engineering design" to the "manufactured product."

Linguist Selection

Consider, for example, the selection process. I am aware of the existence of various screening mechanisms, including language aptitude tests, which are designed to permit only those who are qualified for language training to enter the pipeline. On the basis of my experience, I have to believe that the system broke down. No training in the world, no matter how well staffed with expert instructors or how well structured the course may be, can succeed if the students are either not qualified by dint of aptitude or academic background, or not motivated. If the selection criteria are valid, then they presumably were waived at times. If they were scrupulously followed at all times, then they are invalid.

Language Training

Consider also the training segment. Again, there are undoubtedly tests and various controls or safety valves designed to permit only the qualified to emerge. Here, too, the system had glaring weaknesses. The tendency throughout the war was to evaluate a training program primarily on the basis of the caliber of the graduates. This, in itself, may have been inherently unfair to the school and the instructors in that, as stated before, the students may not have had the prerequisites, and no type of training could have succeeded. We were generally satisfied with the training provided by the National Cryptologic School (NCS) -- we had firsthand knowledge of the skill of our instructors, the content of the course, the qualifications of the students, and the capabilities of the graduates. The physical proximity of the NCS and the fact that training and operations were "all in the family" permitted continuous and close contact with the school authorities and instructors and facilitated monitoring of the program and a reasonable degree of quality control.

With the Defense Language Institute (DLI), however, it was a different matter. Distance,

both physical and organizational, posed a for-
midable barrier, for all practical purposes,
for the kind of liaison that we were able to
maintain with the NCS. The DLI training, for
the most part, remained unevaluated. At times
there was considerable unhappiness with the
skill level of DLI graduates. At other times
the graduates' on-job performance reflected
well on the training they had received. We
tended to treat the symptoms rather than the
cause of the ailment. Where were the weak
points: student selection? the expression of
our requirements? instructors? course content?
the time gap between training and operational
assignment? on-job training? the nature of the
operational assignment? There probably were
elements of all these factors, but to my know-
ledge there was little or no concerted, systema-
tic effort to identify them precisely, weigh
their importance, and take corrective action.

I had occasion to visit an SCA training fa-
cility where I and other members of a TDY team
were briefed on the training programs, their
objectives, and contents. Aware of some seem-
ingly chronic difficulties we had been having
with field product, I asked one of the program
managers if there was any attempt to obtain
feedback from the field stations, such as by a
form to be filled out by the operations officer
which would appraise the performance of the
students who had completed the course. "Yes,
we do have such a form," he responded. "What
do these forms tell you?" I asked. "These forms
tell us," he said with an impish smile on his
face, "that people don't like to fill out forms!"
So much for quality control -- at least in
that program. There were undoubtedly other at-
tempts to ascertain the quality of the trainees,
and perhaps there were some remedial measures
taken -- but the impact of any such measures
was not readily discernible.

Development of Voice Linguists

One of the most frustrating quests in the
area of linguist development was the effort to
produce voice linguists. The personnel who
could transcribe a free-flow, unformatted, and
unpredictable Vietnamese conversation accurately
and with reasonable speed were few and far be-
tween. Try as we might, the system simply did
not, or could not, produce this type of linguist.
Maybe we were faced with an "impossible dream."
The use of indigenous Vietnamese -- the DANCER
program -- for the transcription of VC voice
communications, as well as for direct support
in combat operations (as was the case primarily
with the Marine units), was generally success-
ful. I doubt that the nature and the difficul-
ty of the tasks we expected the trainees to per-
form or the dimensions of the process to produce
such linguists were ever adequately spelled out.
If they were, then again the quality control
was weak or completely lacking.

"Targetists" vs. "Functionists"

The deployment and use of Vietnamese lin-
guists were generally and rightfully considered
to be organizational prerogatives. Down through
the years at NSA, the organizational structure
has been the object of a tug-of-war between the
"targetists," those who advocate plugging all
the necessary cryptologic skills into one tar-
get-oriented unit, and the "functionists," who
would organize primarily along functional lines
and assign specific skills to specific problems
on a temporary or ad hoc basis. Should crypt-
analysts or programmers, for example, be con-
centrated in one organization, or should they
be dispersed among various organizations? In
either case, at what echelon? -- section,
branch (or the new "work centers"), division?
As the Vietnamese language problem grew in quan-
tum jumps, the "targetists" emerged as the dom-
inant influence. The linguist workforce was
fragmented and linguists were assigned to vari-
ous elements within the VC problem. In terms
of effective and efficient use of scarce re-
sources, it was one of the worst things we
could have done. There was much to be said
for this organizational approach, and there
are those who are convinced that it was the
only method. I, however, remain unconvinced.
I believe we paid too heavy a price for the
dismemberment of the Vietnamese language ef-
fort. The effect was to dilute control over
the most skilled of the Vietnamese linguists
whose talents could have been applied over a
much broader area in the management and con-
duct of SIGINT language functions. As it turned
out, they became highly localized, or special-
ized, if you will. So in the critical areas
of linguist development, product review and
control, field support, standards, flexibility
in linguist assignments, construction and main-
tenance of language working aids, especially the
most vital of them all -- a comprehensive dic-
tionary -- our posture was weakened. Organiza-
tions that corner the market on talented person-
nel understandably tend to place such people
under a form of "protective custody," regard-
less of the size or complexity of the workload.
The Vietnamese problem was no exception. We
will never know what might have been if the
"functionists" had won the tug-of-war. I will
never cease to wonder, however.

Language Lessons Learned

If we have really learned our lessons from
the Vietnam experience, we should be taking
action in any or all of the following areas:

● *Establishment of a system of quality con-
trol for linguist training and development.* The
terminal objectives must be defined in specific,
unequivocal terms.

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The system should include such items as an Operational Qualification Examination (OQE) which would do two things: a) license the linguist to practice, and b) provide a barometer on the effectiveness of the training program.

● *A thorough review of the selection criteria.* Are the criteria valid? Are they being maintained? It may be a normal reaction to relax them in times of crisis, but that is precisely when we must *not* relax them. We cannot compensate by quantity for what we lack in quality -- at least in the world of language and linguists.

● *Evaluation of the training programs.* Are they meeting our requirements? Do they need revision or updating? Can we really develop linguists who, for example, can cope with a ___ or are we reaching for the unattainable? What mix of trainee qualifications and training programs is needed to produce such a linguist?

● *An active dictionary system.* Only in recent years have we awakened to the importance of having authoritative, current, and comprehensive dictionaries in the languages for which we are responsible. It was only in the late 1960's that the Vietnamese language effort produced such a dictionary, known as RICE BOWL, for Vietnamese and a system for managing and maintaining it. The dictionary was also computerized and could even be interrogated on-line. A USSID was issued establishing it as the authority to be followed by NSA and SCA linguists in translation and standardization, as well as the procedures for its maintenance.

Someone in that distant past had had brilliant foresight, but, unfortunately, the infant glossary was never given the necessary nourishment and it, as well as the idea, died. Our failure to build on that glossary was a crucial mistake, and it cost us dearly in the ensuing years in terms of linguist capability and product quality. Very useful information on the meanings of new terms and the expansion of new abbreviations appearing in traffic went down the drain. Who needed to document and disseminate that data, it was felt. After all, John Doe and Mary Smith, our senior linguists, were immortal and would always be around to answer questions! Actually, however, the dictionary is "the linguist's best friend." Accuracy and speed in SIGINT language production are very often dependent on

the quality of that friendship. The fragmentation of the Vietnamese language problem was undoubtedly a factor in our neglect of this vital working tool.

Today a language-processing organization that does not have an active dictionary system, in which new terms and abbreviations are duly recorded and processed for inclusion in a machine-listed data base, is simply not fulfilling its responsibility. This is clearly not a technical problem. It is a management problem. We have reared a generation of linguists who assume that once a message is scanned or translated, or a tape is scanned or transcribed, their task has been completed. Since they do not document the new terms and abbreviations for the benefit of others, the wheel keeps getting rediscovered. One of the senior NSA linguists once suggested that a linguist's performance appraisal should automatically include a rating on the linguist's fulfillment of the responsibility to extract dictionary data from the traffic he processes. This suggestion has much merit and should certainly be a factor in performance appraisal.

● *Consolidation of linguists and language problems.* We should take a long, hard look at the current deployment of our linguist workforce to determine if consolidation would be advisable. Are we deriving the maximum benefit from the most skilled of our linguists? Do linguists have the opportunity to work on a variety of targets or perform a variety of functions? Are we confining them to a specific target or area in order to satisfy an artificial organizational bias? In our Vietnam experience, there were some elements that were "linguist-rich" and others that were "linguist-poor." The negative impact of such situations on linguist development and product quality control are obvious.

Career Incentives and Motivation

The problem of career incentives and motivation could easily be the subject of a separate article. The difficulties encountered in the Vietnam experience were symptomatic of long-standing attitudes toward language work and linguists. I happen to believe, for example, that the SCAs will never really develop a truly professional cadre of career linguists until such time as senior translators and transcribers are given officer ranks. It takes about 15 months to train a fighter pilot to the point of combat readiness, and a much longer time to develop a professional linguist to a *point of* "combat readiness." I have yet to see a fighter pilot who is *not* of officer rank or an SCA full-time professional linguist who *is*. In the NSA context, it is absolutely essential that selected individuals whose strength lies primarily in their mastery of a foreign language and the ability to apply this knowledge in the SIGINT world be at the GG-15 and GG-16 levels and be highly visible to the linguist population. Opportunities for advanced language training and

the chance to grow in the profession are equally important. The crush of the pressures of a war-time situation did not afford us much time for a proper exploration of the subject of linguist incentive and motivation. Identifying the root causes of the dissatisfaction or disinterest of Vietnamese linguists may have shed light on situations that were unsatisfactory and which management actions may have been able to remedy or at least improve.
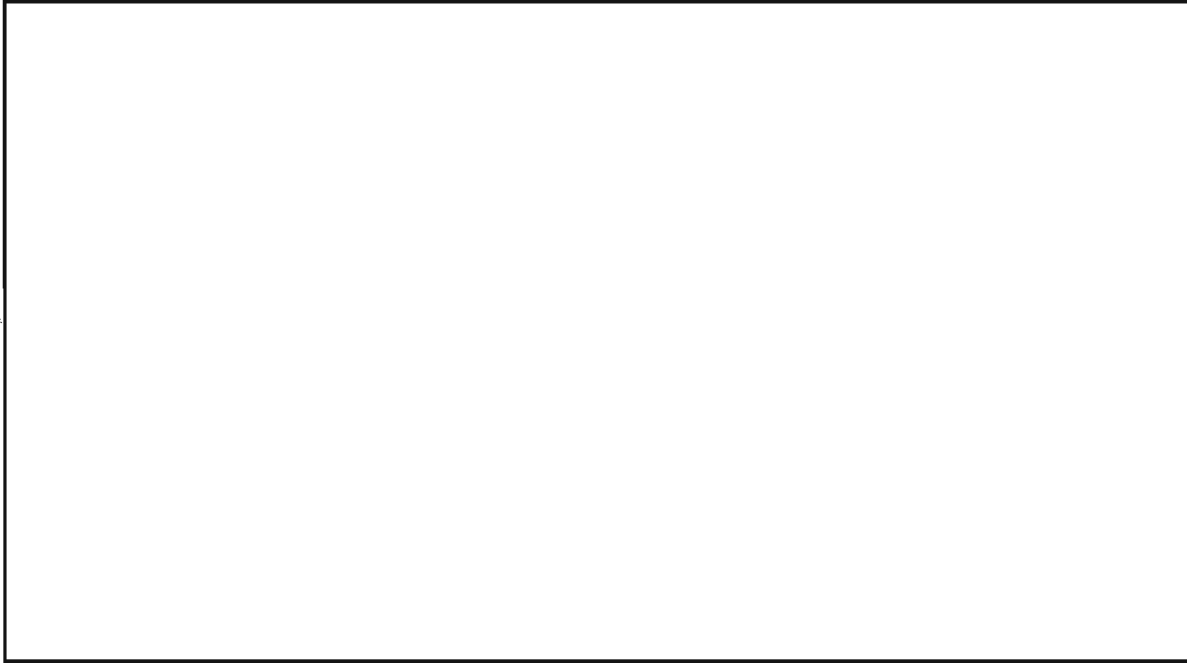
There are undoubtedly many lessons that were learned from the Vietnam experience. These few that stand out in my mind are by no means exhaustive, but I believe they do offer us guidelines for the future. Since they are presented from a personal point of view, they are subject to debate. They are couched in general terms because the individuals and organizations were but players in the drama -- as the Bard of Avon said, "The play's the thing." They are stated with that greatest advantage of them all -- hindsight.

Had there been a publication called *LESSONS LEARNED FROM THE KOREAN WAR*, with a detailed account of the problems and pitfalls in the effort to develop an effective SIGINT Korean language capability in a wartime context, we might have been better equipped to respond to the requirements for SIGINT support in the Vietnam War. Perhaps we would have done things just a little bit differently with much better results!

The SIGINT record in the Vietnamese conflict is one of considerable achievement. The Vietnamese linguist contributed immeasurably to that record. It is the hope here that as we continue to examine our language posture and to strive for ways to strengthen and develop it to a point of both "peacetime effectiveness" and "combat readiness," at least one or more of the "lessons learned" from Vietnam will be of some value.
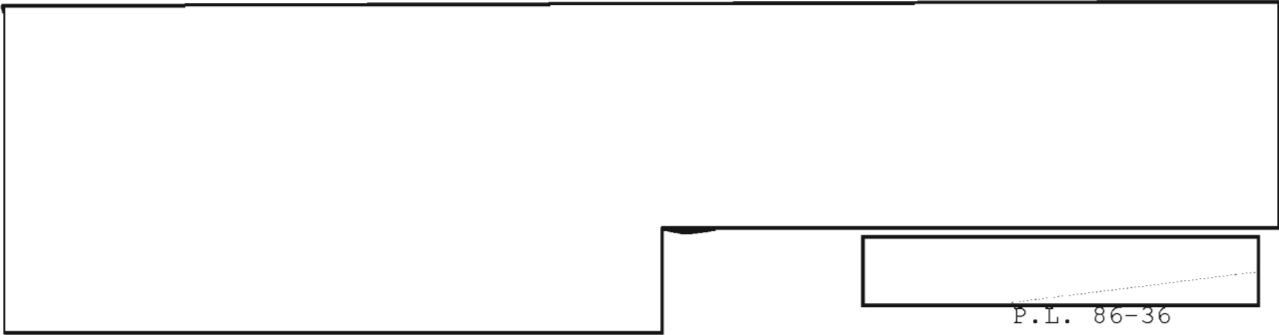
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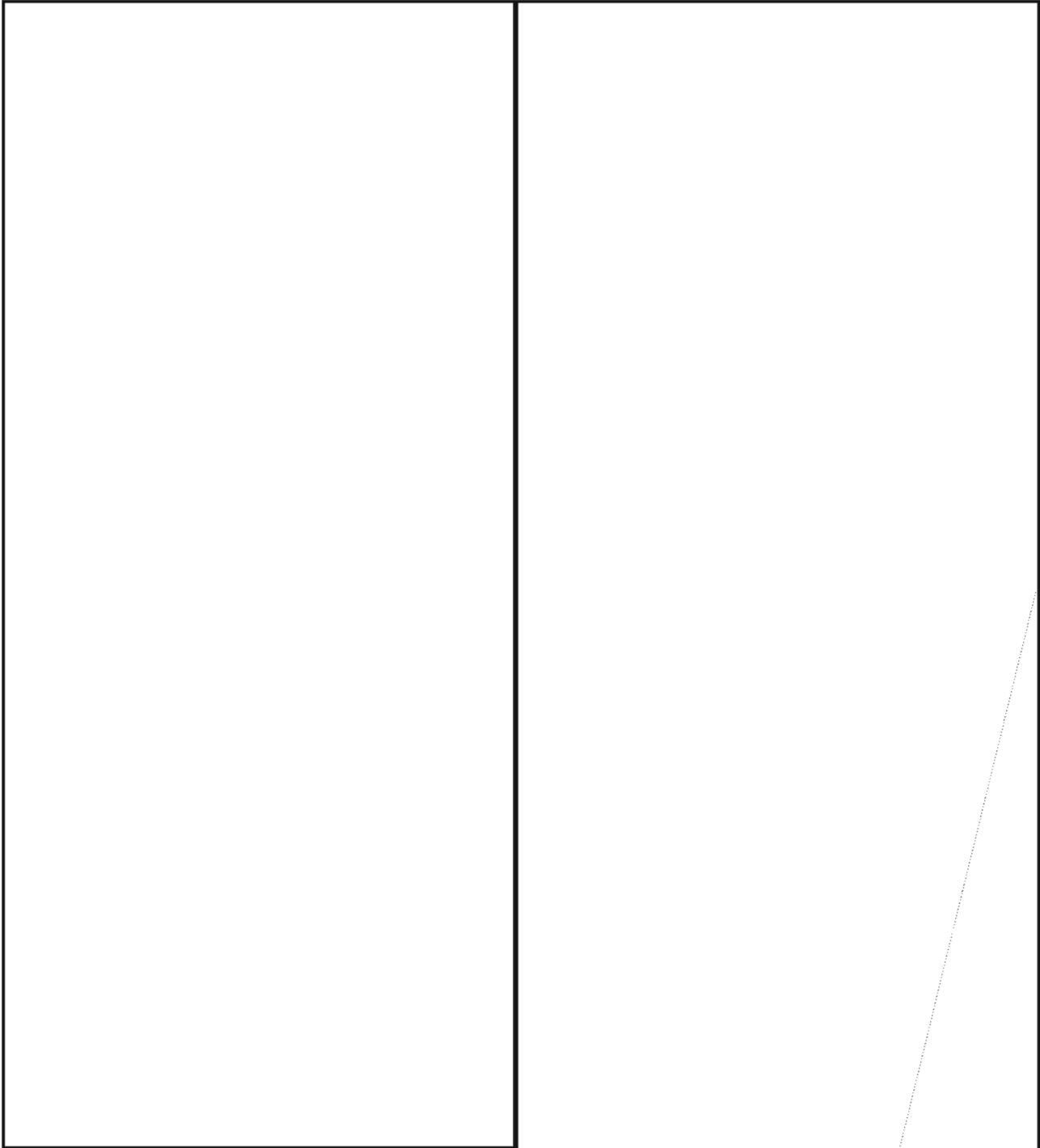P.L. 86-36

THE WINNAH–KID APOSTROPHE!

It was a tough fight, Maw, but I lost! I
knew that Kid Apostrophe would be a tough con-
tender. One of our editor's, Vera Filby, wrote
a short item, "The Apostrophe: Some Thought's"
(CRYPTOLOG, November 1974) in which she dealt
with plural ending's, with and without apostro-
phe's. So when I became CRYPTOLOG editor I knew
I'd have a tough bout with the Kid. Well, here
I am, after putting the fourth issue together,
and I'm throwing in the towel. For four months,
Maw, I tried to make sense out of how to plural-
ize abbreviations. SOI's? TECHSUMs? But now,
after hearing all the arguments about "familiar
vs. unusual abbreviations," abbreviations that
"sound like words" vs. those that you read like
individual letters, those that end with an S in
the singular anyway, etc., I know when I'm
licked. So in this issue, and in subsequent
issues, any and all abbreviations will be
pluralized *without* the apostrophe: SOIs, ASTDs,
TECHSUMs, etc.

In case this offends any purists, here!
Sprinkle them in at will! ''''''''''''''''''''
''

(UNCLASSIFIED)

P.L. 86-36

NSA-crostic No. 1

In the early 1950's I constructed a series of about 60 Russian-language Double-Crostics as language-teaching aids (does anyone still remember those purple Ditto sheets?). Recently I have received a numerable request to construct a new series. But I'll do better than that: I'll construct a series of Englilh-language ones using quotations from published works of our own NSA-ers. The following NSA-Crostic is the first in the new series. (Solution will appear next month.)

CRYPTOLOG Editor

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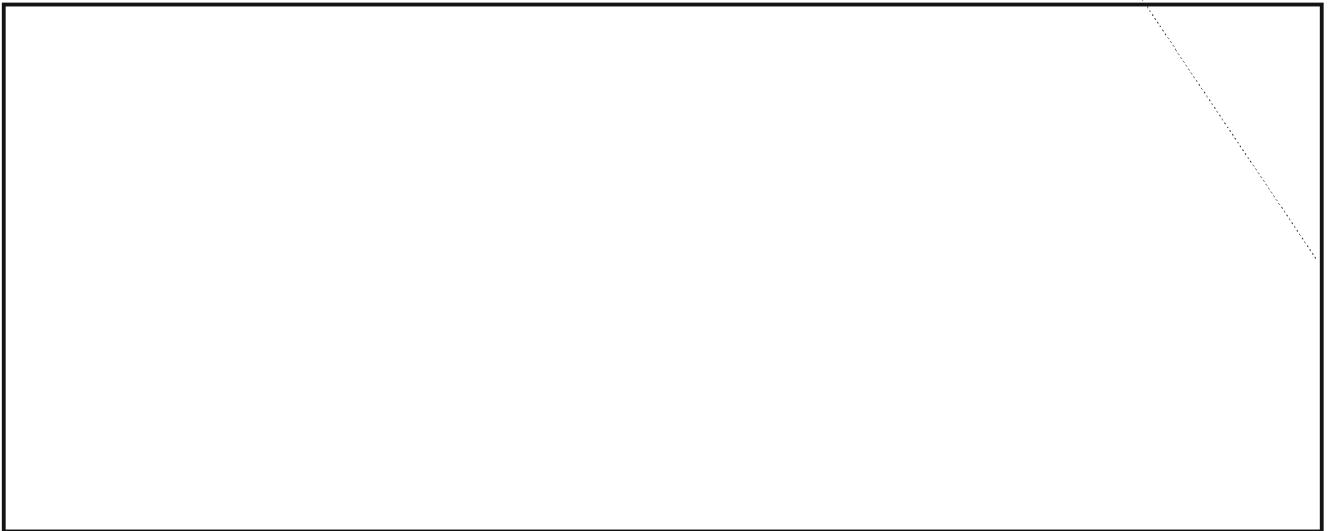
IRONHORSE:
A Tactical SIGINT System

P.L. 86-36

During the Vietnam conflict, tactical commanders in Southeast Asia (SEA) had a continuing requirement for more and better tracking data on aircraft activity over North Vietnam (DRV). Increased low-altitude activity and scrambles of MIG aircraft could not be seen by U.S. radar. As command's ability to exercise direct control over U.S. aircraft improved, so did their need for this type of tracking data. U.S. SIGINT provided these commanders with tracking data at low altitudes and during deep penetrations into enemy air space. In answer to their need, a USAF Security Service unit, the 6924th Security Squadron (USA-32) stationed at Da Nang, RVN, began providing a limited amount of needed data through Project HAMMOCK in November 1965.

HAMMOCK was a manual plotting system of SIGINT derived from USA-32 copy and from information relayed from airborne intercept platforms (ACRPs) operating over the Gulf of Tonkin and Laos. HAMMOCK, however, had severe limitations. Intercept from USA-32 was relayed to the Tactical Air Command Center, Northern Sector (TACC,NS) (Fig. 1), at Monkey Mountain, by secure tele-
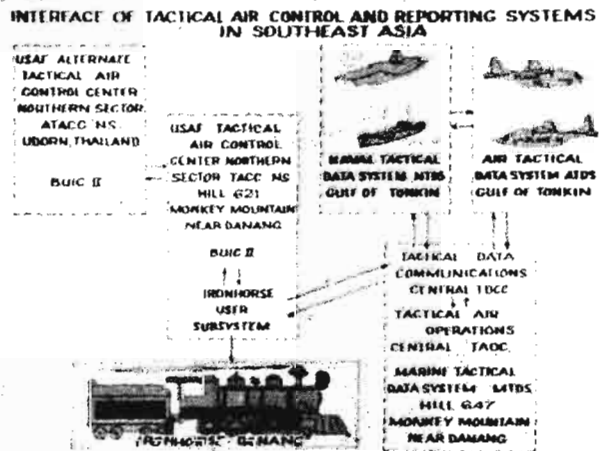
The need for a rapid and therefore automated transfer of data was realized. Systems attempting this had been achieved. The success of Project FURNACE, the automated plotting of SEA strike activity, begun in June 1964 and operational by mid-September, led to a project to rectify this time problem. Approved in November 1964, the project was given code name IRONHORSE. The office of R8 assumed responsibility for the technical development and provisioning of equipment for a "visual display of SIGINT derived tracking of aircraft reflected in [   ] DRV Air Defense Communications."

EO 1.4.(c)
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The problem as seen by R8 was that of a classic command and control operation. The mission of TACC,NS was the control and warning of USAF strike aircraft over DRV. Data from a maximum number of inputs had to be reduced and fused into a common data base and presented to the battle commanders. Their solution was a data processing/display/forwarding system to automate the processing of manual data through the use of cathode ray tube (CRT) displays and the rapid forwarding of selected track data to the consumer via a data link (Fig. 2). In

Fig. 1

Fig. 2

phone. The data was plotted and then relayed via secure teletype to Seventh Air Force, where it was manually plotted for display to Command officers. TACC,NS also provided this information to the Commander, Task Force 77 (CTF-77) of the Seventh Fleet operating in the Gulf of Tonkin and to the Marine Tactical Data System (MTDS) in the form of radar plots. This manual system was limited to a maximum of ten tracks and its quality and timeliness were affected by the number of steps involved. Time from intercept to the consumer was usually 8 to 10 minutes, during which time an aircraft could have traveled 150 miles from the area of interest.

addition, all intercept would be placed on magnetic tape for later processing and forwarding in an Electrically Formated Air Intelligence Report (ELFAIR). The area of coverage included North Vietnam, Laos, [   ] South Vietnam, [   ] This area was considered to be within the established range of the combined U.S. radar system, defined as a 180° arc, 235 NM from 19°30' north latitude 170°00' east longitude. The reason for limiting coverage to this area was to prevent compromise of SIGINT-related tracking information to non-SI cleared individuals.

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After the original concept was approved in November 1965, it took 2 years to assemble the necessary equipment and to write and debug software. The equipment was installed in vans and delivered to Da Nang in November 1967. After 4 months of testing and interfacing with TACC,NS the system was declared operational by USAF on 27 March 1968. Later in that year, a new operations building was built and all IRONHORSE equipment, the S&W center, and operator positions were put under one roof. Shortly after the March operational date, it was decided to build a second system, IRONHORSE II, to be placed at USA-29, Udorn, Thailand as a backup for the Da Nang system. A fire in the Marine bomb dump in April 1969 caused virtual destruction of the operations building. The force of the explosions and the accompanying shock waves caused the base perimeter to be moved, and the Operations site was isolated from the rest of the base. Emergency destruct procedures were initiated. Most of the computer programs and documentation were destroyed. Fortunately, none of the IRONHORSE hardware was damaged. The equipment was removed to an environmentally controlled quonset hut. For the next 3 months, two programmers and a data analyst reconstructed programs, manuals, and operating procedures. A new operations building was built and IRONHORSE resumed operations in July 1970. The IRONHORSE mission was continued at Da Nang until April 1971. During November 1970 the decision was made to move IRONHORSE II to Udorn to take over the USA-32 mission concurrent with the U.S. withdrawal of forces. The system remained operational until December 1972, when the SEA tactical data interface was terminated.

The hardware for the IRONHORSE system consisted of a special version of two AN/GYK-9 FLEXSCOP computers (CP818s). Inputs were provided by 22 AN/GGC-15 (AG-22) configured intercept positions (Fig. 3), which copied both

Fig. 3

manual morse and radio telephone and from four Model-35 teletypes operated by data analysts (Fig. 4). CRTs were added to meet the requirement that it be a visual display (Fig. 5). The

Fig. 4
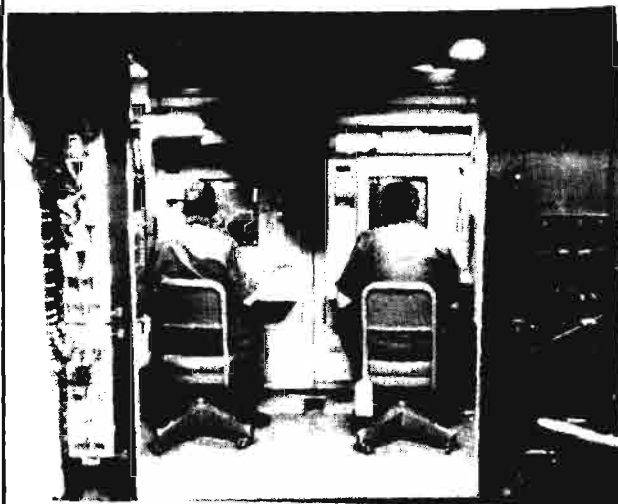
Fig. 5

CRT presented a map showing significant land masses, coastlines, major rivers, islands, and political boundaries, and was overlaid by a grid system (Fig. 6).

The operator positions would copy aircraft position reports and amplification data such as altitudes, numbers, and aircraft types. The TTY would electronically feed intercept track data to the computer, which would convert the position reports to Geographical Reference Grid (GEOREF), decode the amplification data, convert the callsign and frequency to a station location for azimuth-range position reports, recognize ELFAIR-relevant traffic, flag it, and place all traffic on magnetic tape. The second computer could then edit and decrypt the information, presenting it to the analyst operating the CRT display. The analyst would first see the data as a blinking trace and, upon command,

Fig. 6

could retrieve and display any amplification
data. The computer was programmed to detect
and reject irrelevant chatter and, if tracking
data was in an unrecognizable form, it would be
printed out on an edit console, where the edit
analyst would correct the information and re-
enter it.

The CRT analyst was required to recognize in-
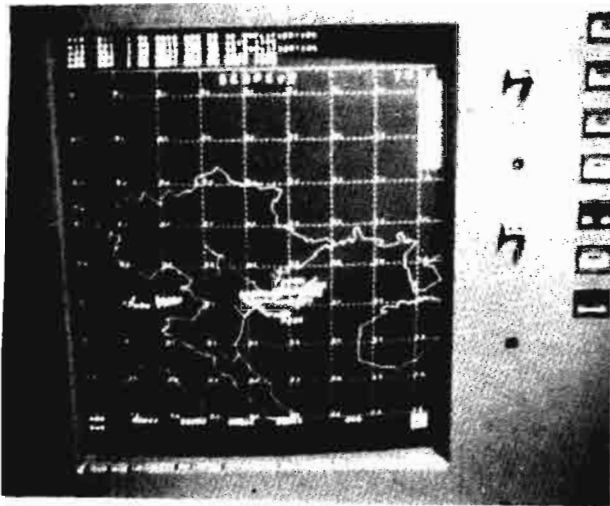formative [   ] tracking data and initiate
forwarding to the consumers. Since all copy was
displayed, the CRT analyst would decide which
command level of the air defense net to forward.
Information that was redundant or superfluous
would be left in a suppressed mode or purged
from the system. Upon command from the analyst,
the computer would automatically forward desig-
nated data to the Seventh Air Force TACC,
Seventh Air Force Command Post, Seventh Fleet
Commander (CTF-77), and the Marine Tactical Data

Center simultaneously with transmission to
TACC,NS. CRTs at these locations would present
[   ] tracking data in the sanitized form
of GEOREF plots with limited background ampli-
fication. The commander could then combine
this information with other tracking data re-
ceived via the SEEK DAWN[1] interface to make his
decisions. The net result of IRONHORSE was to
reduce the intercept-to-consumer time from 10
minutes to a matter of seconds.

The IRONHORSE system was able to complete
its mission effectively. It gave battle com-
manders the near real time reflection of air-
craft positions they required. It had the
ability, by nature of its source, to reflect
aircraft at low altitudes. In the case of dog-
fights and shootdowns, the position of downed
U.S. aircraft could be relayed to Search and
Recovery (SAR) missions[2]. Regardless of the
cost, if the system was able to aid in the re-
covery of one pilot it was worth the investment.

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[1]SEEK DAWN was the exchange of digital air
tracking information between TACC,NS at Monkey
Mountain and Marine Tactical Data System, Navy
Tactical Data System, and the Air Tactical Data
System units in Vietnam and the Tonkin Gulf area.

[2]I was at USA-32 from August 1969 to August
1970 during the bombing halt and had no direct
reflection of the use of SAR. However, as an
amusing anecdote, during one of the "probe"
missions (sending a photographic drone in over
Haiphong and Hanoi at treetop level), two
MIG-17s were scrambled. The MIGs intercepted
and the trailing MIG locked on and fired a heat-
seeking missile. Unfortunately, the other MIG
was between the missile and the drone. Only
one MIG returned to base and the drone was later
recovered in the Gulf.

ANSWERS TO QUESTIONS IN "ABDUL & HIS 40 TANKS"

(CRYPTOLOG, August-September 1975)   EO 1.4.(c)

P.L. 86-36

THE DANANG PROCESSING CENTER

A852

The South Vietnamese Danang Center and lower-echelon SIGINT units in ARVN Military Region I (MR-I) were intended to provide intelligence to the MR-I J2 and to the ARVN combat divisions within that region. This intelligence took the form of daily intelligence summaries and spot reports issued by the Center and its subordinate units.

Danang Center and the other SIGINT units in MR-I had their successes and occasionally produced valuable tactical intelligence. Unfortunately, they did not produce enough; it was not produced fast enough; and the SIGINT users at Corps level did not have a proper appreciation of the validity and usefulness of SIGINT.

Following the signing of the Paris Peace Agreement, the tactical environment in Vietnam took on a "fixed-piece" posture where enemy units made few tactical movements. The result was a loss of many national intelligence sources such as document exploitation and prisoner interrogation. With the loss of these collateral sources, SI should have come to the forefront of available sources supplying the national J2. However, the production of this SIGINT, at least in MR-I, was not satisfactory. It is the purpose of this article to explain some of the reasons why I think the overall ARVN SIGINT effort was a failure and fell short of its mission and to touch briefly upon life in Danang.

* * *

An assignment in Vietnam following the withdrawal of U.S. military forces in February 1973 was unlike any other NSA overseas assignment. The Paris Peace Agreement limited the number of U.S. Department of Defense personnel allowed in-country.

One U.S. representative was assigned to each of the three ARVN SIGINT field centers at Can Tho in the Delta, Pleiku in the central highlands, and Danang in the northern regions. each field representative was provided with housing, a vehicle and gas, purchase privileges in their bar, restaurant, and commissary, and inclusion in most of their social activities.

The ARVN SIGINT organization was known as the Directorate General for Technical Services (DGTS) and had its headquarters in Saigon. The Danang Processing Center was the northernmost field Hq of the DGTS and had a personnel strength of 329 men. Danang Center operated 50 Morse intercept positions on Danang Airbase and a collection effort on top of nearby Monkey Mountain.

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Each of the six ARVN combat divisions in MR-I had an organic SIGINT unit known as an ARVN Special Technical Detachment (ASTD). These ASTDs controlled 35 highly mobile low-level voice intercept (LLVI) teams which were capable of short-notice deployments to keep up with enemy movements. LLVI teams were also intended to accompany the combat units into action to provide real-time direct support.

Top-level officer administration in the MR-I SIGINT organization was generally excellent, middle-level management was weak, and low-level was poor to nonexistent. The top-level managers were well educated, trained, and motivated, but a lack of these qualities among the lower-level officers prevented full productivity of the Center from ever being attained.

LLVI team operation could have been far more productive if the lieutenants and senior NCOs had been more professional. Most of these teams were located in forward areas and I was unable to visit many of them. Those I did visit invariably needed basic improvement. Antennas were often oriented in wrong directions or were found to be grounded; radios and generators were rarely properly grounded; bunkers were not secured with perimeter wire and the men had not been counseled in document and equipment destruction in case of overwhelming enemy attack.

As another example, in December of 1974, Danang Center was tasked with collection of North Vietnamese air surveillance tracking data. The particular radar sites and sector filter centers we copied were located in the southern panhandle of North Vietnam and we hoped that North Vietnamese MIGs deploying to staging bases just above the DMZ or actually penetrating South Vietnamese air space would be reflected on these cases. It was suggested that the Center be able to tip off, via phone, such MIG movements to the MR-I Commander, the MR-I Air division Commander, and the South Vietnamese radar facility located atop Monkey Mountain.

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But weeks after starting collection of these communications the analysts plotting the tracking data were found to be working 2 days behind, a delay hardly acceptable when the computed flying time between the DMZ and Danang Airbase was approximately 6 minutes.

The South Vietnamese were never able to make the airborne direction finding (ARDF) program function as the money-maker it was while under U.S. control. Several management problems crippled the effort. Even in the final days of South Vietnam's existence, when locating data on the many NVA Divisions ringing Saigon was critical to an organized defense, it was impossible to force the responsible officers to straighten out the ARDF program.

Six EC-47 ARDF aircraft and their crews were assigned to Danang but were rotated every 2 weeks from the Squadron Hqs in Saigon. The men were directly subordinate to Saigon. This meant that the MR-I Hqs could not control the flights even though they were the primary user of the DF fixes. Support for the aircraft was also in Saigon. If an aircraft needed parts or maintenance that could not be provided by the few men assigned to the EC-47 hangar, it would have to wait until the aircraft was ferried to Saigon.

For a good part of the year, the morning weather in MR-I is generally cloudy but it usually clears up by afternoon. Cloud cover has an adverse effect on the Doppler navigation system used in the EC-47's, so many morning flights were aborted. However, by afternoon, when the flying weather was perfect, the crews had disappeared for the day.

Gas stealing by the crews was also a major problem. Most of the officers had oversized briefcases lined with plastic bags which they filled with gas from the aircraft wing tanks and carried through the airbase gates to sell on the black market. Ground crewmen also took their share and it was not unusual for a completely topped-off plane to be drained overnight. While I was there, at least two of Danang's aircrew barracks were destroyed by fire caused from plastic bags of aviation gas.

The flight crews were also rough on wing tips. In December 1974 I noticed that there had been several recent mission cancellations due to "wing tip repairs". Not understanding this, I drove to the flight line and watched as an EC-47 returned from a mission and taxied into the parking revetments. The normal procedure at any airfield would be for a few ground crewmen to meet the aircraft and guide it into the parking area, making sure there was sufficient clearance between the wing tips and the revetment walls. While I watched, though, the only assistance the pilot got was the brief appearance of a ground crewman from the hangar who ran out in his BVDs, pointed a finger at the nearest empty revetment and then ran back

into the hangar and climbed into his hammock. It was small wonder the pilots scraped off so many wing tips while making unassisted parks.

Payoffs, corruption, and nepotism were a way of life in the Vietnamese government and the ARVN SIGINT organization was no exception. I soon learned that it was far easier and quicker to "buy" a service or cooperation than to go through normal channels. Two six-packs of beer would get a half-day loan of a forklift, a few cigarettes would gain entrance to a restricted area, and a fifth of cognac would guarantee a staff officer's cooperation in obtaining real estate for a field site expansion. Some jobs simply could not be done without a bit of preliminary palm-greasing.

Corruption within the officer administration of Danang Center was accepted as long as it did not get out of hand and the officers continued to produce. One officer, a Center Commander, eventually devoted so much time and effort to lining his own pockets and was so incompetent in his job that he had to be replaced. It was impossible to stop the thievery completely. The best we could do was to keep it at a minimum and accept some losses as long as the job got done.

The extensive nepotism could be turned to advantage. It was always more productive to conduct business arrangements with an officer of a support organization who had a relative on our staff. Likewise, an almost equally strong allegiance as blood relationship existed between old college classmates and this was used to advantage whenever possible.

The Vietnamese had their own ways of doing things and these methods were not without humor. In late July 1974 I received a message that ▮ would soon pay us a visit. I informed the Danang Center Commander of this and suggested to him that he have the grass in the antenna field trimmed as it was quite high and posed a fire hazard. The General would be sure to spot it. The next morning I arrived at work to find that a fire of unknown origin had "quite mysteriously" swept the field and consumed the grass. Unfortunately, this fire also destroyed several lead-in cables which connected the Center's antennas with the multicouplers, effectively wiping out over half of our antenna system. In my mind, I suspected that Captain ▮ the Center Commander, had ordered one of his lieutenants to have the grass removed and the lieutenant, without devoting a great deal of thought to what he was doing, touched off the grass with a match. I never did have the courage to pursue the cause of the fire but "accepted" Captain ▮ dictate that "unknown" circumstances caused the fire. Weeks later, when new grass was starting to grow in the field, the Captain and I spent part of a day trying

EO 1.4.(c)
EO 1.4.(d)
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to buy a calf to tether in the field and eat grass. We were not able to get an acceptable price on a calf, although sheep and goats were going cheap. Unfortunately, both sheep and goats consider RG-11 lead-in cable to be a gourmet's delight and so had to be ruled out.

The rainy season in Danang occurs during the winter months of November through March and is opposite the rainy season in Saigon which occurs during the summer months. Also Saigon's rains are characterized by being torrential and occurring a few times daily but lasting only minutes. Danang's rains generally lasted for days but rarely did it rain very hard.

In Danang, the continuous humidity caused mildew to grew on almost everything and even saturated paper so deeply that graphite would run. Many of the Center's roofs leaked and the communications center roof was of major concern because of the electronic equipment. As repair materials were unavailable, Captain [   ] had an ingenious system of catch basins and troughs installed. The most unusual remedy to a leak was over an HW-10/HW-19 crypto device. [   ] had the men punch a hole in the nearest wall several feet below the ceiling and run a rag from the leak in the ceiling to the hole in wall. Thus the water ran down the rag to the outside by capillary action instead of dripping on the equipment.

Going to and from school, the dependent children of Danang Center walked past my quonset hut which was just inside the perimeter cyclone fencing. Vietnamese children are adorable and I got in a habit of giving them, through the fence, small hard candies which I bought at the U.S. commissary. This was quite a treat for them and they would wait for hours on the road for me to come out of my hut. Eventually this got a bit out of hand and on occasion as many as 50 or so children would gather. I didn't have enough candy for groups this large and so I wouldn't go outside when I heard them calling from the road for me. One day one of them got the idea to throw a rock onto my roof to get my attention -- which it did -- and bring me outside-- which it did. At this time, Danang Airbase was regularly taking VC 122-mm rocket attacks and these rocks, crashing onto the metal quonset hut roof just feet over my head, were enough to send me diving under my desk.

The DGTS had difficulty in organizing and maintaining communications between their own units. The lowest echelon of the DGTS was the LLVI team. It comprised two to five men, one or two radios, one or two rudimentary 292, sloping-V, or doublet antennas, and sometimes a typewriter. By directed or random search, these teams would find and copy VC low-level voice communications. Messages on these links were usually encrypted in easily read, hand encryption systems. The underlying text had immediate tactical value since much of it dealt with VC

troop movements and preparations for forthcoming attacks. Decryption of these messages was performed at the next echelon by the ASTD. These ASTDs were organic to ARVN combat divisions and were responsible for the immediate processing and reporting of decrypted messages to the Division G2. All too often, however, the ASTDs received the encrypted messages days after the actual intercept. As a result, much of the decrypted information obtained was after the fact. Most of the ASTDs in MR-I attempted to visit their teams a few times a week and courier the raw intercept back. Gasoline rationing often curtailed these visits. In at least one case, an ASTD resorted to civilian taxi motorbikes to get the intercept.

In November 1974, in an effort to speed up the forwarding process, our Saigon COMSEC office allocated secure voice KY-8 systems to three of the MR-I ASTDs and their subordinate LLVI teams. With this equipment, it was hoped that the teams would be able to radio their raw intercept directly to the ASTD just after copy. But several problems kept this project from ever being fully successful. The KY-8s and their associated VRC-46 radios frequently could not be supplied with stable electric power at the LLVI team. Crypto management problems occurred. The men operating the gear and the officers responsible for them often did not have sufficient training in crypto set-up and use, and minor maintenance problems with the VRC-46 radios could not be corrected locally. As a result of these problems, little time was saved in getting the intercept to the processing and reporting echelon.

The ASTDs supported their parent divisions with intelligence product but forwarded their technical material and raw intercept to Danang Center.

The 1st ASTD at Phu Bai had two 60-wpm teletype circuits to Danang Center which employed HW-10/ HW-19 crypto security. Two circuits were necessary as this ASTD processed intercept gathered by its own LLVI teams and those teams subordinate to the Marine, Ranger, and Airborne ASTDs. The traffic volume on these circuits was high, so much so that prepared message tapes often had to wait days for transmission. In addition, the Marine, Ranger, and Airborne ASTDs generally batch-forwarded their material to Phu Bai once weekly and this caused poking backlogs in the Phu Bai communications center. On several extreme occasions when hundreds of prepared message tapes were backlogged at Phu Bai, I or a Danang Center courier was allowed a seat on an Air America helicopter to get the tapes from Phu Bai to Danang. This procedure was not encouraged since we were trying to get the Vietnamese to depend on their own support organizations rather than U.S.

The 3rd ASTD at Hoa Khanh also had a single circuit to Danang Center. The operation of this

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circuit was continually plagued by technical problems in the cable. Flooding and sporadic rocket attacks were blamed for cable outages, and it was rare when the Vietnamese Air Force, responsible for that portion of the cable on Danang Airbase, and the Vietnamese Army, responsible for the cable portions from the airbase to the Hoa Khanh Hqs, could agree on where the break occurred. As a result, the majority of the intercept provided by this ASTD was usually *couriered to Danang* Center via jeep, and even though the ASTD was only a few miles away over perfectly secure roads, it took constant prodding to get them to make the trip more often than once weekly.

The supply and maintenance methods used by Danang Center can be summed up as almost totally inadequate. In retrospect, I now think that a working logistics system is the most critical requirement of any field operation. Danang Center had many personnel, management, and technical problems, but even if these had been solved, mission effectiveness could hardly have improved without sufficient working materials and equipment maintenance.

Several examples of our poor support come to mind. For supplies such as pencils, erasers, and tape the Center received no allocation but was given approximately $40 a year to buy the supplies on the open market. It was barely a fraction of what was needed, considering our consumption of these materials.

We received our typewriter ribbons from Saigon Logistics. To supply the 75 or so typewriters we had -- which were used almost continuously -- we were given 12 ribbons a month. This meant that each typewriter received a new ribbon approximately every 6 months.

The local MR-I Maintenance Company which was responsible for maintaining Danang Center's "common equipment" such as R-390 radio receivers, recorders, typewriters, etc. was not regularly given updated copies of our Table of Organization and Equipment and so was never able to stock enough of the parts needed for our equipment.

Many equipments and supplies basic to operation of an intercept site were not stocked at Danang Center, the MR-I Logistics Command, or at Saigon. Such items were antenna wire and insulators, TMC boxes, lead-in cable, RF connectors, and ground strap. So desperate were we for some materials that on one occasion when our Saigon resident engineer, and I were fabricating new antennas for the ASTD at Phu Bai, Charlie entered a minefield trying to "liberate" a pair of unused TMC boxes and failed only because VC 85-mm field gun rounds started dropping around him.

Soon after the U.S. military withdrew from Vietnam and the DGTS had assumed complete responsibility for the collection, analysis, and reporting of SIGINT, it became apparent their state-of-the-art would not advance as rapidly as we wanted. The DGTS simply would not be pushed faster than they wanted to go. I feel their management and logistical problems and their lack of a true desire to learn the production and use of SIGINT contributed to the overall failure of the independent ARVN SIGINT effort.

Answers to CRY-PTO-LOGrolling puzzles

(See CRYPTOLOG, August-September 1975)

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P T O L E M A I C
U P T O W N E R S
T I P T O E I N G
C R Y P T O L O G
N O T U P T O I T
T H E T I P T O P
G I V E L I P T O
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C R Y P T O L O G
A C R Y L A T E S
E N C R Y P T E D
D E S C R Y I N G
X E N O C R Y S T
N O R D I C R Y E
I N F U L L C R Y
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L O G O M A C H Y
S L O G A N I Z E
P H L O G O S I S
U N C L O G G E D
P E D O L O G I C
B U M P O L O G Y
C R Y P T O L O G
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(UNCLASSIFIED)

PAPER ON CHARACTER STREAM SCANNING BY MACHINE

R51, has recommended that broader publicity be given to a recently published P16 paper. He writes, "Some of the readers of CRYPTOLOG may have missed seeing (let alone reading) a recent document on the perennial task of program writing (debugging, maintaining, updating, etc.) for operational tasks involving compter processing of data in which alphanumerics play a significant role.

"The paper, dated March 1975, is by Mary P16, is entitled *A Systematic Approach to Character Stream Scanning by Machine,* is classified SECRET, and bears the official document number S-211.893. Copies may be obtained from Room 3W076, 4998s."

~~(CONFIDENTIAL)~~

TACTICAL LANGUAGE EXPLOITATION:
A Lesson Learned?

B11

Vietnamese is an "exotic," strange-sounding language, particularly to a Westerner's ears. None of the vowels or consonants sound like anything in English or any of the Romance languages. And, of course, it has those tones! As a result, training in Vietnamese involves a complete readjustment of the student's learning process, starting at "base zero." This is, at best, a lengthy procedure.

As the Vietnam War heated up and more and more large-sized Vietnamese Communist (VC) units were committed to combat, the air became saturated with low-powered voice transmissions, often between individuals at the platoon or squad echelons of the combat force. Collecting this mass of transmissions was a monumental task which could never be totally accommodated. Beyond that, since most of the voice data was extremely perishable, rapid exploitation of the collected signals was critical. . Often, lives hung in the balance, depending upon whether the attack orders could be understood instantly or required extensive processing before being reported. To attempt to grapple with this language need, the Service Cryptologic Agencies sent thousands of young men through various language schools to teach them Vietnamese. And they learned the language -- they learned how to read newspapers, order meals in a restaurant, count to 100, work with a dictionary on complex written subjects, etc. There's nothing wrong with that kind of training -- I'm not maligning it. Within the short period of a year, training speakers of English to function at all in Vietnamese is a fine accomplishment, and these people did function. But within the space of their training they could not achieve -- and could not be expected to achieve -- the auditory proficiency needed for on-line exploitation of low-level tactical conversations in a combat situation. This special skill -- being able to think in a language -- takes years to develop. Many people never achieve it at all, no matter how long or how hard they try.

Fortunately for us, the VC had a methodical approach to warfare, and, among other things, were quite conscious of communications security. Thus, except for actual in-combat transmissions, they were quite precise about what could be passed, and how various types of information could be handled. For example, although many types of information were routinely on the air, more sensitive things, such as after-action reports which included casualties, were almost never observed in any traffic that we could exploit, presumably because, in addition to denying us that information, the VC did not want their own units to learn inadvertently how their comrades had fared in battle.

But this still did not accommodate the plaintext voice problem, and it was apparent to all parties that this problem simply could not be successfully accommodated using U.S. linguistic personnel. (I should note that I am speaking in broad generalities. Certain facets of the plain language problem -- notably tactical air -- were within the capabilities of the U.S. personnel, primarily because of the stereotyped nature and limited vocabulary of such transmissions. But let me continue with the generali- . ties.) Native linguists were the only real solution, and were acquired in small numbers, with many restrictions on both their physical and cryptologic security. This program, originally known as the DANCER program, and later as the BEES, helped fill the breach, especially on those signals that could wait for transcription until they reached an area occupied by the DANCERS/BEES. Such lengthy conversations/signals as those passed [   ] were ideal for this program.

Suffice it to say that U.S. linguists proved able to copy simple transmissions, [   ] and provided combat support on a near real-time basis from these sources. Native linguists were able to perform the more complex transcription tasks, thus contributing immeasurably to the overall understanding and measuring of the enemy's intent and capabilities. We never achieved an on-line capability for plaintext tactical voice.

Tactical Voice Capability in Future Wars

We must assume that in any future wars, against other nations, there will be the same real need for on-line exploitation of tactical voice transmissions. One possible means of addressing this need is to take native linguists and use them on position. If they can relate in English what they have heard, so much the better. But at minimum they can write down the essence of the intercept in their native script and pass this immediately to a U.S. translator for necessary processing and delivery to the tactical commander.
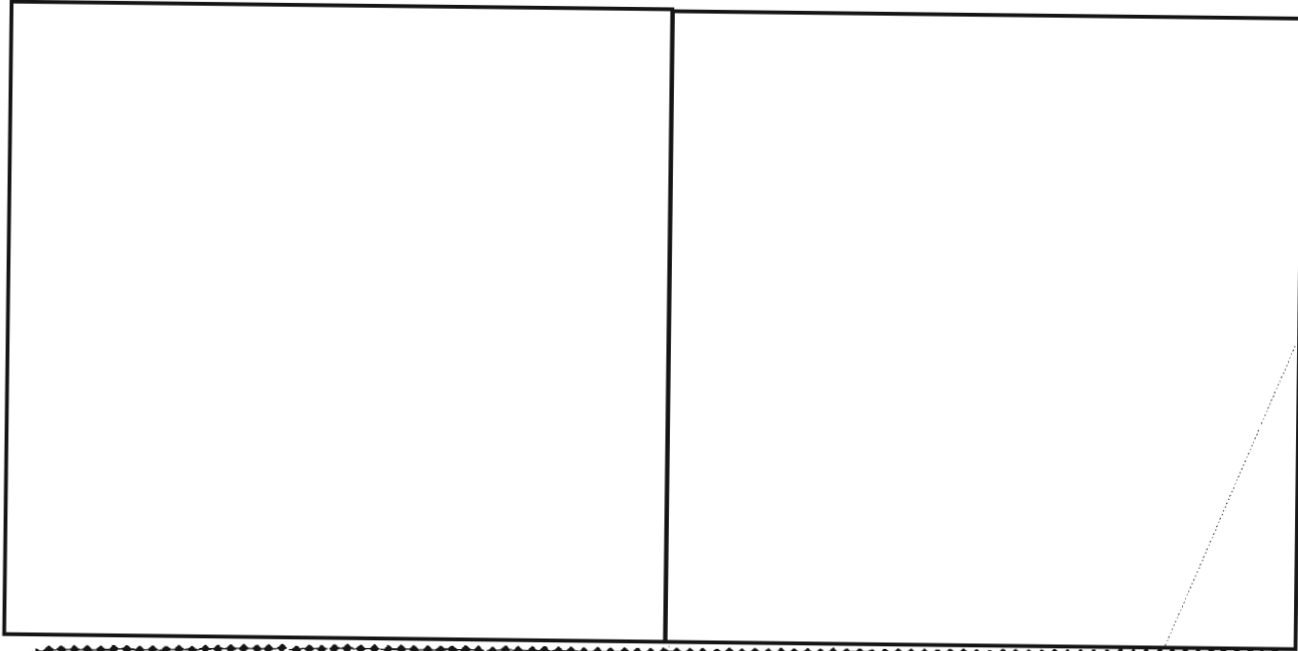
UPCOMING LECTURES sponsored by the CRYPTO-LINGUISTIC ASSOCIATION

CLA

MONDAY, 17 NOVEMBER, 1000
Brigadier Tiltman
will speak on

The Voynich Manuscript

FRIDAY, 19 DECEMBER, 0900
P. W. Filby

"THE GWEEKS HAD A GWOUP FOR IT"

(Reminiscences of Bletchley Park in the 1940s)

Both lectures will be given in the William F. Friedman Memorial Auditorium.

By the by, speaking of Brigadier Tiltman and Bletchley Park, next month's issue of CRYPTOLOG will include the Brigadier's critical review of F. W. Winterbotham's The Ultra Secret.

AUTOMATION OF A TA PROCESS
Tim Murphy, B341

effort to mechanize our analytic findings and create a single processing system. In addition to transmitting our analytic findings to field sites, we also used this data to create identification dictionaries that became the heart of our match-ident process.

What few people realize is that the work-load associated with the Southeast Asian (SEA) problems did not decrease as U.S. forces withdrew from Vietnam and B3 (previously B6) underwent successive personnel reductions. In fact, the amount of SEA communications intercepted and processed at NSA was still peaking in 1975 when the South Vietnamese government fell.

Traffic analysts have borne a proportionate share of the decrements incurred by B3, yet there has been virtually no drop in target communications. Analysts have been assigned larger case loads and have assumed responsibility for collection management; yet, in my view, the quality of analysis has improved and the analysts, in general, are not overworked. There is little doubt that technical support to field stations has improved significantly.

The automation of a large segment of the SEA traffic-analytic processes has been the key not only to high-quality analysis but also to our ability to do the job better over the years with fewer people. Fortunately, during the early stages of U.S. involvement in Vietnam managers with the Traffic Analytic Support Division for the Vietnamese problem took an enlightened view toward mechanization. With help from some of the Agency's leading traffic analysts and a cadre of highly-qualified data-systems personnel, the first steps toward an automated traffic-analytic process were taken.

At the same time we began a major

Of equal importance to these contributions was the fact that the methods that the experts used and the approaches that they took to the TA task rubbed off on many of the junior analysts working the SEA problem. This group of analysts, with outstanding support first from C5 and later from B42, continued this trend toward automation, always striving to relieve analysts of most of the repetitive TA tasks. (c) and to permit more time for actual analysis 86-36 Among their major contributions were:

- the creation of a single analytic data base -- the Southeast Asian Case File (SEACF):

In addition, the availability of on-line access to our data base in recent years through the COPE terminal has led to many analyst-initiated special programs that have greatly expanded the analysts' capacity for research. I should also point out that field stations tasked against SEA targets have also taken many initiatives toward automation.

### SEA Machine Data Bases, Processes, and Resources

SEACF

Perhaps the most significant single step toward reducing the workload of SEA traffic analysts was the creation of the Southeast Asian Case File. The SEACF not only resulted in highly efficient data-base management, but also permitted many follow-on processes that greatly reduced the workload of SEA traffic analysts.

Many of the processes that were introduced during the early stages of the Vietnam War to mechanize the TA process required the establishment of data bases to support them. As

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those processes expanded, the number of data
bases expanded to the point where analytic time
saved was being spent on data-base maintenance.
A review of those data bases revealed that
there were a large number of common fields of
information but comparatively few unique fields.
In effect, we were multiplying our file-mainte-
nance workload and making ourselves vulnerable
to contradictions between identical data items
in different data bases. The major data bases
that had to be maintained prior to the imple-
mentation of SEACF were:
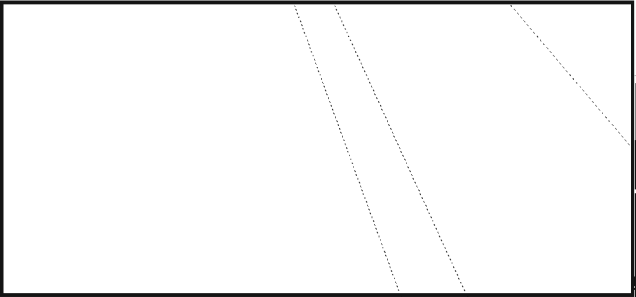
   The SEACF consolidated all these data ele-
ments into a single data base, thus eliminating
the requirement to maintain those multiple
data bases. Since its establishment the
SEACF has been expanded to include data ele-
ments that support both cryptanalytic and
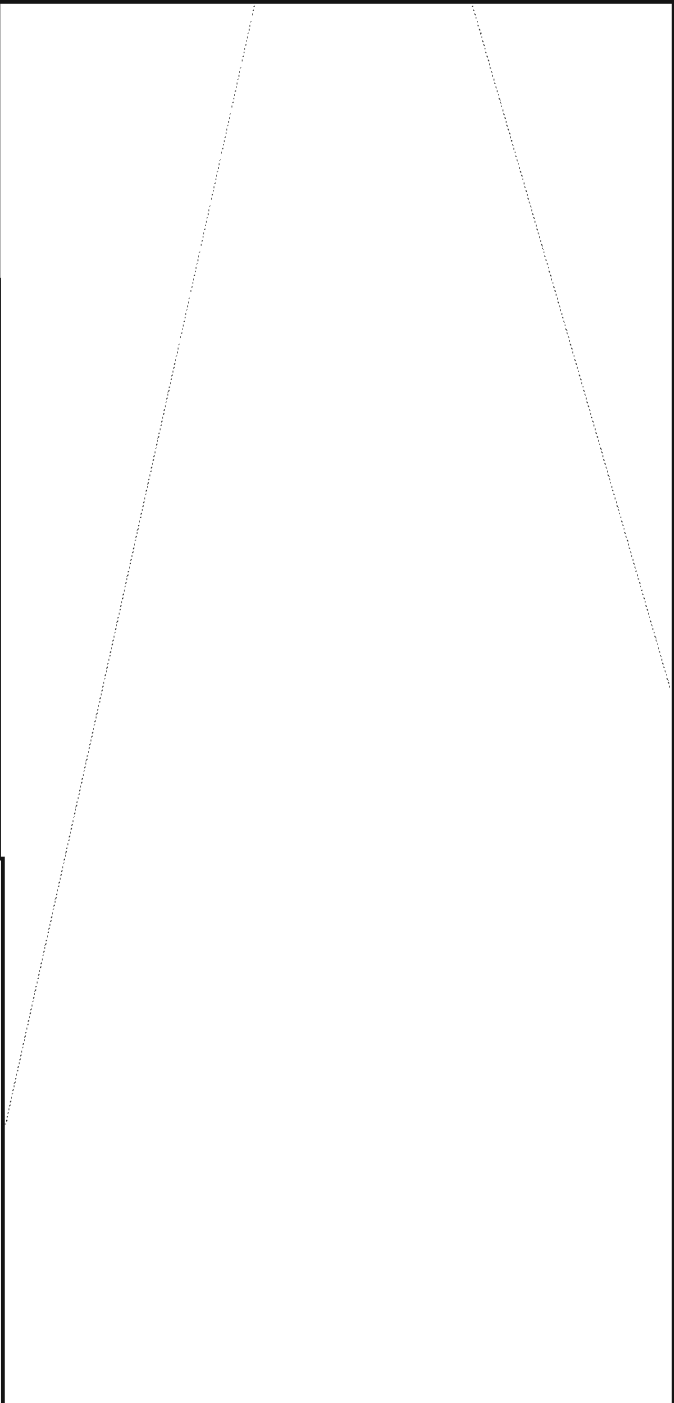collection-management functions.

   As now constituted, the SEACF consists of
eight basic data records which analysts use to
provide permanent maintenance of the communica-
tion characteristcs and crypt characteristics
of a given target, identification and location
data on that target, and also collection-
management data.

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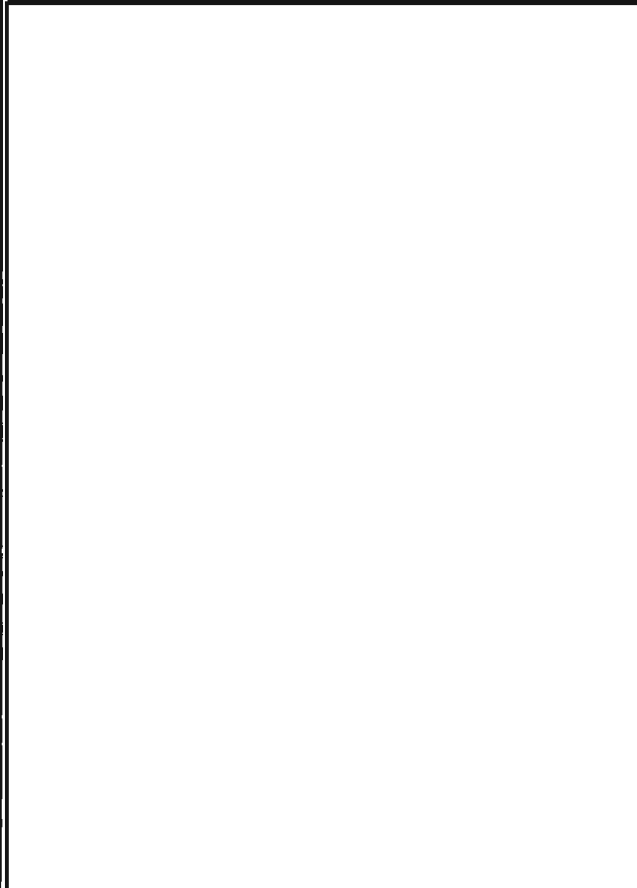
It was inefficient and time-consuming for analysts to collate all these varied inputs, yet very necessary from an analytic standpoint. Hence they were eventually collated by machine as part of our daily process, and our activity data base is now a composite of all primary-source technical inputs.

IATS

Another major step in automating both the traffic-analytic and the traffic-forwarding processes was the implementation of IATS. The user routine developed for SEA communications copied on IATS or AG-22 intercept positions --
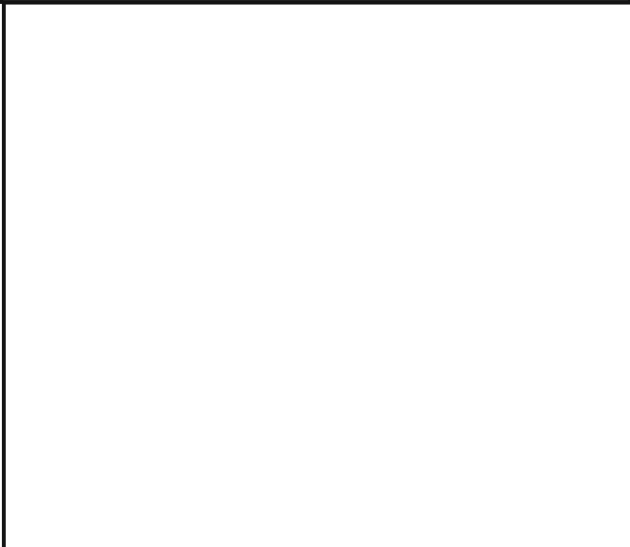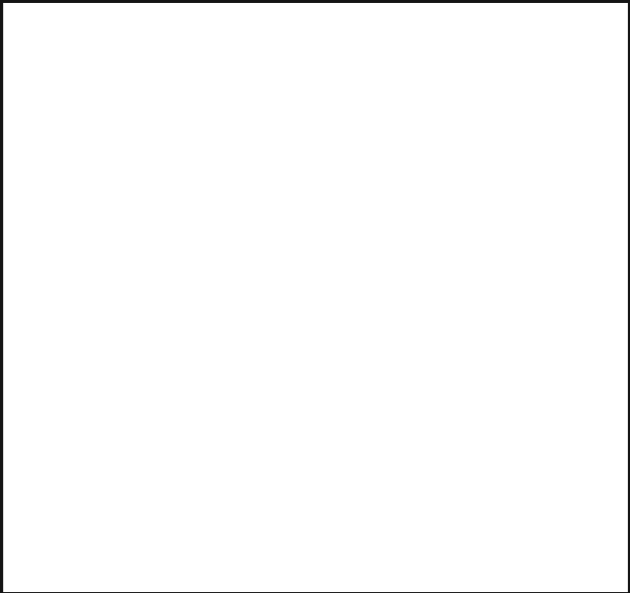
This program reduced by countless hours the task of the SEA development analyst. To a large degree the analyst has been able to rely on the machine to isolate new continuities and then concentrate his or her efforts on identifying that continuity to region or function. The number of analysts tasked against the development problem was reduced from 45 to 10 between 1972 and the spring of 1975 with no adverse effect on the mission. Much of the credit goes to the SEADEV process that has just been described.
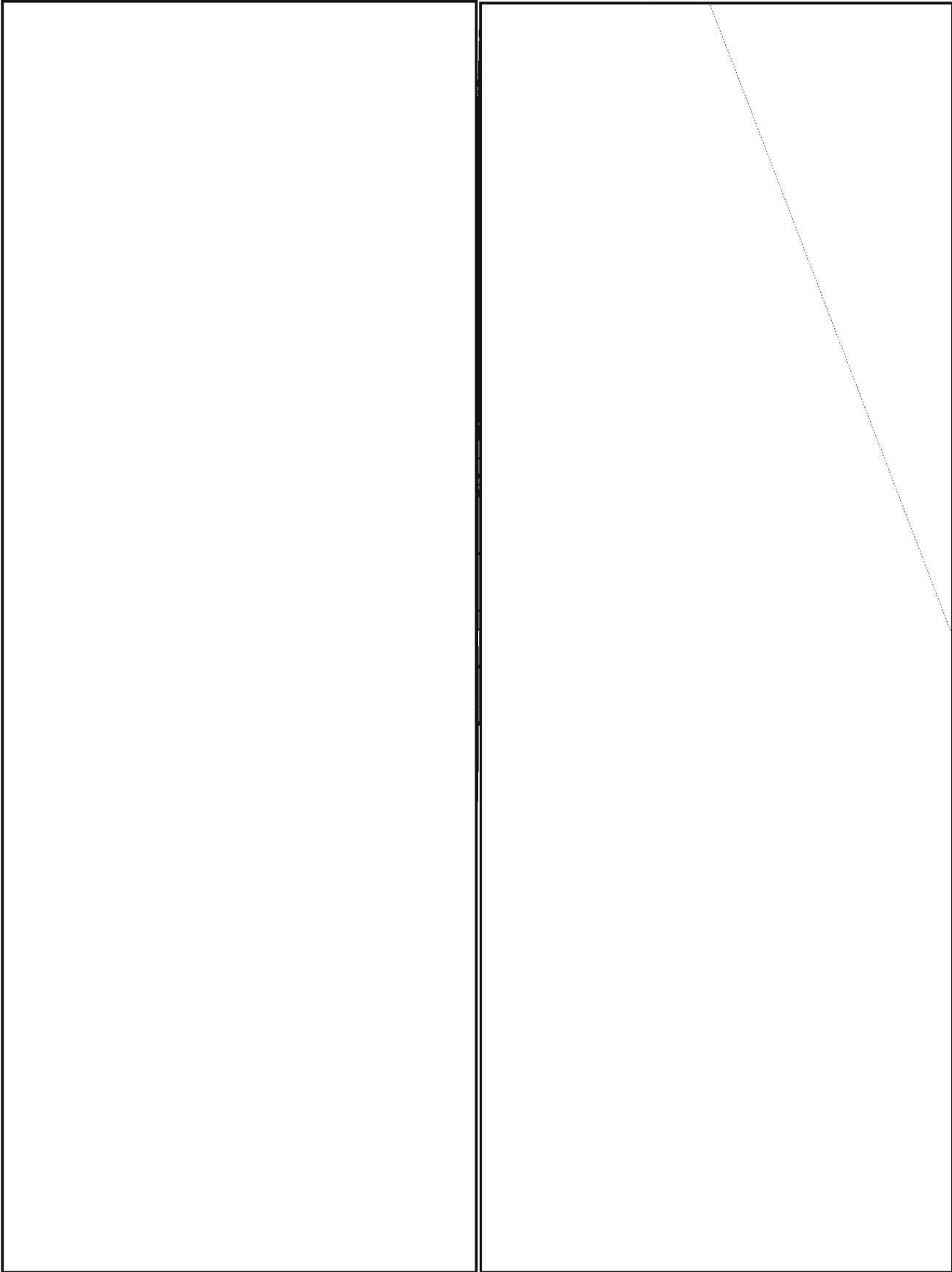
DORIS MILLER HONORED

Doris A. Miller, editor of CRYPTOLOG from its inception until her retirement in June 1975, returned to the Agency on 4 August to receive the NSA Cryptologic Literature Award. Lt. Gen. Lew Allen Jr., Director, NSA/Chief, CSS, presented the award at a ceremony in his office in the presence of a small group of Doris's friends.

The award is in recognition of the many valuable contributions that Doris made to the cryptologic literature during her distinguished career at NSA.

(UNCLASSIFIED)

NEW PROGRAMMING INSTRUCTIONS!

The following item is reprinted from the April/May 1975 issue of C-LINERS (C Group Machine Processing Information Bulletin).

The STARTING GATE Advanced Programming Language Study Group has been holding regular planning sessions aimed at the development of advanced programming techniques for the forthcoming new System/1776 computer network. Some of the proposed new instructions have been noted in the minutes of the sessions (written on soggy beer mats) and are presented for comments. The Study Group would welcome any additional instructions, which should be sent to the Editor, C-LINERS.

BH	Branch and Hang
IIB	Ignore Inquiry and Branch
TDB	Transfer and Drop Bits
DO	Divide and Overflow
SRZ	Subtract and Reset to Zero
PI	Punch Invalid
SSJ	Select Stacker and Jam
FSRA	Forms Skip and Run Away
RASC	Read And Shred Card
SRSD	Seek Record and Scar Disk
BST	Backspace and Stretch Tape
RIRG	Read Inter-Record Gap
UER	Update and Erase Record
EMF	Emulate 407
SPSW	Scramble Program Status Word
EIOC	Execute Invalid Op Code
EROS	Erase Read-Only Storage
PBC	Print and Break Chain
CM	Circulate Memory
MLR	Move and Lose Record
CRN	Convert to Roman Numerals
DMPK	Destroy Memory Protect Key
DC	Divide and Conquer
EPI	Execute Programmer Immediately
LCC	Load and Clear Core
HCF	Halt and Catch Fire

(UNCLASSIFIED)

Impact of Automation

In summary it can be said that the impact of automation on the SEA problem has significantly reduced the number of analysts required to do the job. The caliber of analysts required has increased, however, since his or her primary remaining function is pure analysis or, to use another term, "thinking." Many of the crutches that have kept analysts busy over the years (e.g. logging, sorting traffic) are gone.

To function effectively SEA analysts must have an understanding of their data bases and of how machines can be used to manipulate the data that they contain. Imagination is currently a key asset since much of what can be imagined in terms of analytic approaches is now feasible. There is an increased demand for the traffic analyst/programmer. Knowledge of the SPECOL retrieval language is becoming a highly desirable attribute of the SEA traffic analyst. In short, the impact of TA mechanization has made B3 like the Marine Corps. B3 now needs "a few good *analysts*."

BACK ISSUES AVAILABLE

Copies of most of the back issues of CRYPTOLOG can be obtained from the Editor, Room 3C099-1, x5642s. If you have recently become aware of CRYPTOLOG (newly assigned to NSA? recently returned from overseas PCS? just never noticed CRYPTOLOG before?), you might like to read some of the back issues. They contain a lot of good articles!

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COMPUTERS, COMMS, and LOW-GRADE CIPHERS

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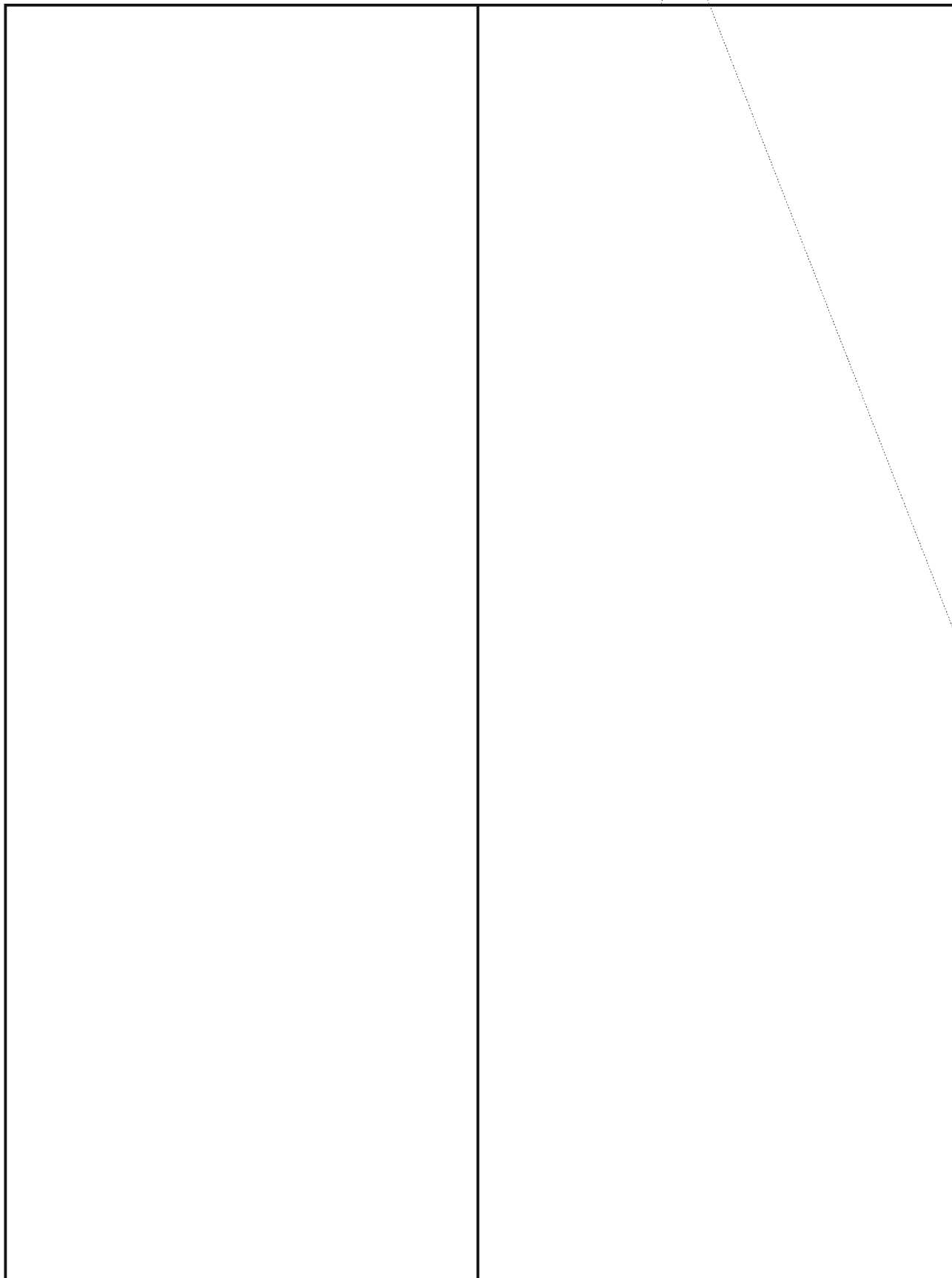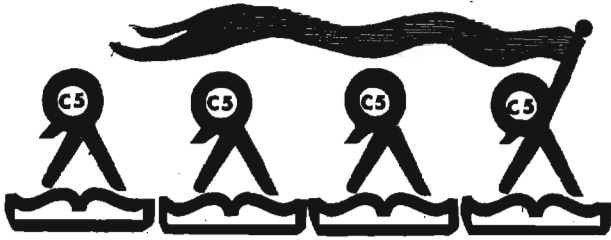
LINGUISTS - YOU **HAVE** AN EXPERT TO CALL!

The expert, in this case, is not an expert in *widgets* or in beekeeping, but an expert in finding information. There are quite a few of them in the Agency and they're located in Central Information, C5.

The publication of [____] article on the need for an "experts yellow pages" in the August-September issue of CRYPTOLOG was a disappointment to those of us in Central Information who spend a considerable amount of time providing the type of service [____] finds so sadly lacking. A survey of recent requests for information yields numerous examples of terminology assistance given to linguists and nonlinguists. Are some Agency personnel unaware of our existence and our services? It seems unlikely, as we had a publicity campaign called "INFO '75" just this spring and the April 1975 issue of CRYPTOLOG included a directory of our various components. However, just in case. . .

Central Information, C5, maintains an extensive collection of specialized dictionaries, reference books, journals, and documents on a wide variety of topics. We have people trained in the research techniques necessary to make effective use of these sources. If the desired information is not available here at NSA, we have well-established contacts with a wide variety of organizations that can provide assistance.

C5 *does* deal in the specifics of all the many subjects that [____] cites. On Monday we could have told her, as we told another NSA analyst, that the SALT GROUP is a group of European allies of the United States who meet informally to discuss how provisions of the SALT Agreements will affect them as Europeans. We could have told her on Tuesday that *Merlucius capensis* is the common hake, on Wednesday that gold-secured loans come under the Zeist Agreement, on Thursday that filament yarns will be reviewed during the second year of the Japan-U.S. textile agreement, and on Friday that the term used in the Law of the Sea negotiations is "resources research." *Anytime* we can tell her, or any other NSA analyst, the same thing that we told a Persian linguist -- that when you have a choice of the words *compression, concentration, condensation,* or *solidification* when referring to uranium processing, the correct term is *concentration* (it means the extraction of uranium from ore); or what we told a Spanish linguist -- that the word *blanca,* when referring to cellulose, is translated as *bleached,* rather than *white*; or what we told a foreign-trade analyst -- that the MZ 250 motorcycle is manufactured by the VEB Motorradwerk Zschopau, East Germany and the $\overline{2}$50 refers to the engine displacement (in cubic centimeters).

So, next time, instead of 15 phone calls, make just one -- to the Central Reference Service, x3258s, or consult the Central Information Directory. (If you haven't saved your back issues of CRYPTOLOG, copies of the Directory are available at the Circulation Desk, Main Library, Room 2C051.)

~~(SECRET HVCCO)~~

CMI
CRYPTO-MATHEMATICS INSTITUTE

NOVEMBER LECTURE:

6 NOVEMBER, 0930, Wm. F. Friedman Auditorium

DR. WALTER JACOBS, "Proving Theorems and Answering Questions by Computer"

DECEMBER LECTURE:

4 DECEMBER, 0930, Wm. F. Friedman Auditorium

[____] G49 will speak on "a result from SCAMP 1975"

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ONE CHANCE IN THREE - BUT IT WORKED!
WILLIAM GERHARD

P.L. 86-36

ARDF needs no trumpeters in B Group, in ASA, or in AFSS. But important as the ARDF program was to become, experts in 1961 and early 1962 doubted that the first experiment involving direction finding and an L-20 aircraft would prove successful. As it turned out, there was one chance in three that the experiment which led to the ARDF program in Vietnam would, in fact, work at all. The following excerpts from an interview of ▮▮▮▮▮▮▮▮ D/Ch of Staff for R&D, Hq. USASA, by Mr. ▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ of ASA shed some light on the first ARDF birds to fly for the U.S. in Vietnam; on the early improvising by ASA innovators; and, despite odds against them, on their success.

WHY ARDF WAS REQUIRED IN THE FIRST PLACE

Q. Prior to ASA's becoming involved in ARDF development, was there any ongoing development of the capability within the Army?

A. The answer is really no. There had been, of course, a lot of development of ADF (airborne direction finding) systems for navigation purposes, which don't operate in the HF range and also the FM homers and other VHF navigation systems.

Q. . . .The question I always had. . . Why was it so difficult for us to do that?

A. . . . There is actually a technical explanation for why this difficulty occurs. . . the Vietnamese and the VC were using low power radios. Now, how do I get in HF a low powered radio. . . say, a one-watt power. . . to transmit a hundred miles? Well, the way to do that is to use a horizontal antenna, radiate the energy up to the ionosphere; then the ionosphere causes it to reflect down on the point you want. That means almost no energy is going out directly, so you sit over here on the ground with your direction finder even a half mile away, and there is no ground wave energy to hear. Now, an interceptor can listen because the sky wave is coming down from the ionosphere. I can sit there and copy what he is saying, but when I try to take a bearing, I am trying to take a bearing almost straight up, and there is just no way you are going to do that.

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It was October/November of 1961 when the urgent requirement came out of Vietnam because they [3rd RRU members] had gone in-country and were trying to use AN/PRD-1s, and they couldn't. The AN/PRD-1 is a ground loop type DF set and needs a good ground wave signal to work against. A cable came back asking us what we suggested or what we could do.

THE EXPERIMENT

Q. Was this the 3rd RRU?

A. Our 3rd RRU and specifically. . ▮▮▮▮▮▮▮▮ P.L. 86-36 ▮▮▮▮▮▮ I was the project officer for direction finding systems in these days. ▮▮▮▮▮▮▮▮ and I -- I had the action here through command channels and he had the action there -- had this exchange of messages; there were probably 10 or

12 messages in that sequence. We worried about how to improve the AN/TRD-4s, which is the larger DF set and what we were going to do with his AN/PRD-1s. Then we got on to what we could do to solve it. That was where the idea of trying the aircraft emerged. We thought an aircraft would be useful, and he agreed that probably the aircraft would be great. In November, about Thanksgiving, I went over to Vietnam along with an engineer named ☐☐☐☐☐☐☐ from ECOM [U.S. Army Electronics Command]. . . So we went over and spent a month in Vietnam and wandered around with ☐☐☐☐☐ and the rest of the people involved. We went around on PRD-1 operations ourselves, took receivers and listened, making measurements of what the propagation conditions were.

Q. When and under what circumstances did ASA first become involved with research [and] development of ARDF? Was it a result of the 3rd RRU's recommendation? MACV's? Department of the Army's?

A. You can summarize it by saying that the way we got involved was reacting to the problem -- that we couldn't use AN/PRD-1s to do the job and the proposition was "could we use airplanes?" And the answer was, "Yes, we think we can."

Q. You got together with ECOM on this and went out with ☐☐☐☐☐☐

A. Exactly.

Q. When did you bring Department of the Army into this?

A. We didn't really. . . this whole thing was done on a shoestring. There were no external contracts made during this time frame; all was done in-house at ECOM. There were very few approvals obtained because we weren't talking dollar levels that required any approvals. Secondly, there wasn't a great deal of attention that was attracted in this time frame in the eyes of the Department of the Army. The 3rd RRU was calling for a solution, but it was to ASA. So it was later on that major involvement on the part of DA took place. . .

Q. Were the pilots organic to the unit [3rd RRU]?

A. Yes. I don't know how they came to be, but ☐☐☐☐☐ [CO, 3rd RRU, Saigon] had acquired two pilots, one a CPT ☐☐☐☐☐ who later came and worked here, and CPT ☐☐☐☐ ☐☐☐ They were both Transportation Corps officers and didn't know anything about ASA until they came in. I believe a lot of credit belongs to them for having operated the thing.

Q. Did they come explicitly for this project?

A. Yes, that was something the 3rd RRU had arranged. We went out the first time feeling we could produce the gadget, and ☐☐☐☐☐☐ handled the arrangements for getting aircraft which he borrowed from a Signal Unit, I believe, and the two pilots. Later we came back with the equipment and put it on.

Q. The first planes flew in March of 1962?

A. Right.

Q. How much testing were you doing there?

A. We were running a pretty extensive program. In the first place, it was a fairly simple system, although it performed an elegant solution. We had done work earlier with VHF ground direction finder, a thing called AN/TRD-16, which ECOM developed, which is composed of a pair of antennas differentially connected. That was a very effective ground direction finder in the VHF. That was the technology which we applied to the HF but increased the spacing between antennas. In terms of hardware you weren't talking a great deal -- a receiver, some cables, the antennas on the aircraft, and a little bit of circuitry to connect them. That was the size of it in the first version. It was a kind of thing which did not require weeks and weeks of fabrication. It did require an awful lot of testing. A whole series of antennas were tried to get out of the coupling problem with the airframe -- that was going on at Fort Monmouth -- the actual testing. When we felt we had something, we were able just to use the shops at Monmouth to fabricate antennas, cables, and other things and rush over and install them ourselves. . .

Q. Was there any training involved by the pilots and operators?

A. There was a lot of training by the pilot. This was very demanding of the pilot because he had no navigation sytem which would tell him where the airplane was at the time he was taking the bearing. He had to learn to fly over a point on the ground that he could then identify on his map as he took a bearing. The operator who was flying with him with a map had the duty of operating the receiver. The operator's task was not too different from the one he had operating the PRD-1 or an intercept position. He had to find the signal frequency and copy it, making sure he was on the right one. So that was pretty much what he was used to on the ground except he now was in a plane and had all the risks of getting airsick, etc. But really the pilot was the one who had to do this by pointing the aircraft at the target and slueing the tail back and forth, reading on his gyrocompass while he was still over ground he could recognize. A skilled pilot can do that very well, but this is something the average Army aviator isn't trained to do.

When we installed the thing, we worked a couple of days with the pilots there, refining it. We flew a lot of hours ourselves. They caught on very quickly. To prove what we had done, we had a hidden transmitter hunt. The 3rd RRU hid some transmitters around Saigon and they went out and found them.

If the pilot was careful in finding a bearing, even this first system could be incredibly accurate. For instance, during this hidden trans-

mitter test the system showed which side of a road at a junction the transmitters were. We were talking even then about accuracies of hundreds of meters.

Q. Why were the L-20 aircraft selected for ARDF? Where in the United States, and when, did the initial ARDF testing take place?

A. . . .We found out that this aircraft was fairly available over there. It was adequate for our purposes because you needed something with good visibility; it could carry two or three people and some equipment. . . The L-20 just happened to be a very nice airplane for the purpose. The big thing was, it was available over here and could be maintained because the MACV Flight Detachment was who their people worked with in the beginning -- the old MAAG [Military Assistance Advisory Group] Flight Detachment, actually. The Detachment had L-20s.

Q. Was it the Signal Corps from whom we had borrowed the early planes?

A. Yes, it was the Signal Corps we got the aircraft from.

We had the one aircraft at Monmouth from the Flight Detachment that we had put the antennas on and it eventually worked out very well. That became the basis of the system we took over. We went over with equipment to do three airplanes. As I say, this went as luggage. I went; [____] [____] the ECOM project engineer, went; a technician from ECOM by the name of [____] went; and an airplane technician by the name of [____] job was to mount the antennas on the aircraft. Walter Day was the electronic technician who was to help [____] and me get the system together. [____] and I did most of the flying.

So we had this airplane which worked well at Monmouth. We went to Vietnam, and they had arranged three airplanes to work with. The first plane we put it on, it worked very well. This is the one we did the hidden transmitter hunt from. As soon as that day was over, they took it away from us. We wanted to test a little more, but they figured it worked well enough so that it went into operation. We did fly some operational missions with them for a while to make sure things were working. We worked on the other two L-20's, but neither one of those aircraft worked. We installed the systems and sweated blood for several weeks and finally just had to plain give up. We couldn't make the systems work on these two planes. The reason for it had to do with the way the aircraft themselves are constructed. We apparently had some type of unsymmetrical airframe current distribution. As long as that is symmetrical and you can maintain a decoupling from it, your system will work. But some of the L-20s had been through extensive rehab. The inboard ends of the wings had been painted more coats on the one than the other, and things like this. When they had been put back together you had a ter-

ribly unsymmetrical RF current distribution, and we had no way to adjust for that at the time.

At that time, we found ourselves literally faced with the problem of selecting airplanes. We wound up then leaving those two which worked quite poorly and one which worked very well.. Aircraft tail #5682 was the good one and #33731 and 37963 were the poor ones. We came home and chose airplanes. ECOM sent people -- Walt Day, I believe -- from airfield to airfield finding planes which had not been through this major rehab, eqiupped two, tested them here, loaded them on board an aircraft, and flew them out to Vietnam to give the 3rd RRU the three it was after. The planes they had which didn't work well went back to where they came from. The 3rd RRU wound up then with three working L-20s after that ordeal. Actually, the ECOM lab A/C #55151 and #82012 were the ones that were sent out.

Now, I said there was divine intervention. It turned out historically that one out of the three aircraft worked successfully with this system on it. So the odds were very much in favor that we would have gotten a bad plane in the beginning at Monmouth or that we should have gotten a bad plane in the beginning in Vietnam. Given the suspicion (or skepticism) about ARDF -- we could have very well stopped, had that happened -- and here very competent people had said it couldn't be done anyway. There may not have been such a thing as ARDF today. It was a fortuitous thing and something we speculated about.
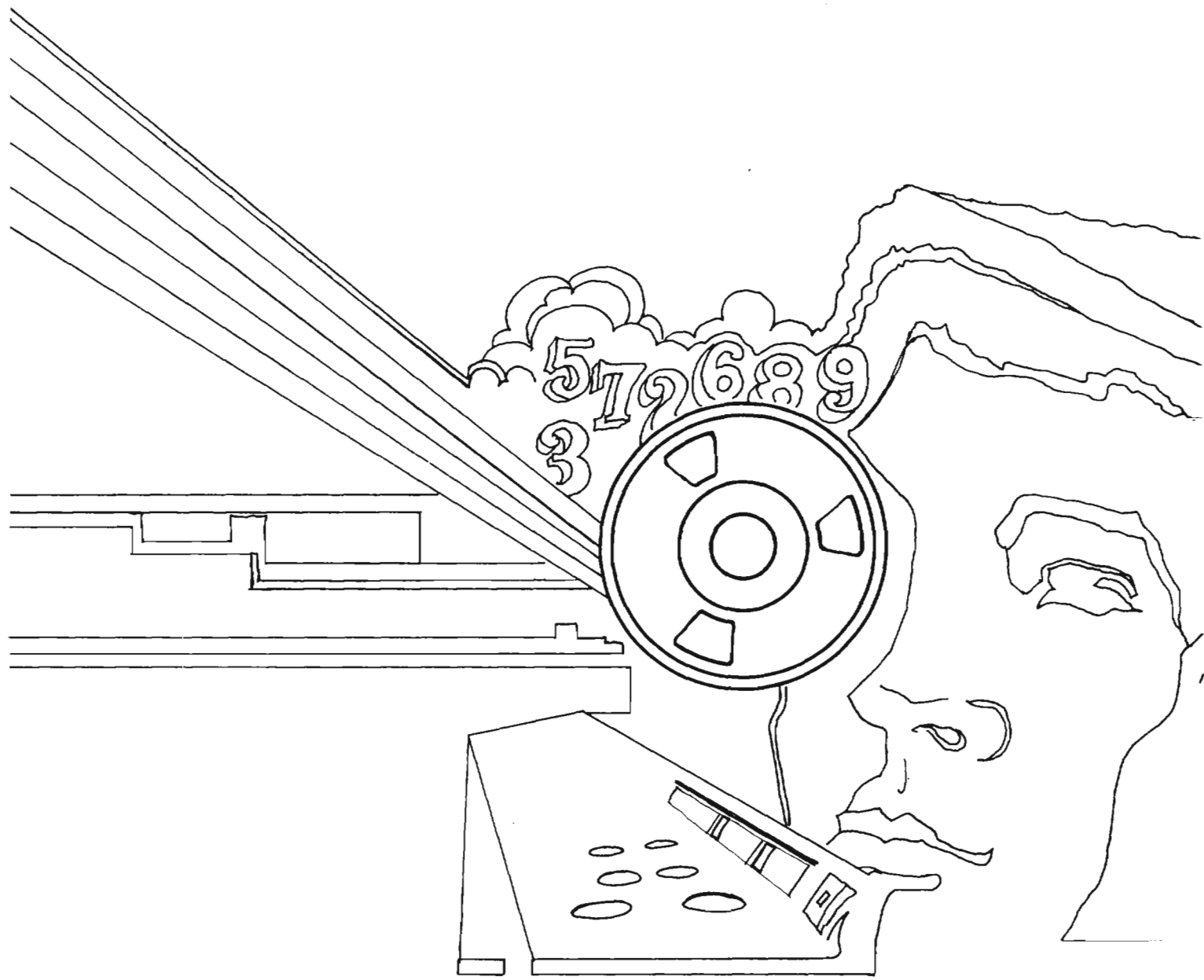
Q. Do you have any. . .anecdotes related to the development of ARDF. . .?   P.L. 86-36

A. I think this business of taking it out as luggage. And the pilots would have been far more worried than they were if they had known just who mounted some of these systems, because all of us wound up riveting things on airplanes. I did. We almost lost it all in Hawaii when they misrouted all our luggage. We had to go at the last minute and dig that out of another Pan American aircraft. I think the selection of aircraft is also significant.

One of the things we took some technical satisfaction in was a little event out there when we were flying the first one. What we would do was to fly to Bien Hoa where we had a DF site and the flash transmitter which controlled our DF nets in Saigon. So we would fly over our DF site at Bien Hoa and shoot that flash transmitter, taking a bearing on it because that was one of the check bearings they used that was supposedly quite accurate. We worked a couple of days because there were a couple of degrees error, and finally in disgust went back and recomputed the check bearing and found out it had been calculated wrong and that the aircraft had been correct all this time.

TOP SECRET