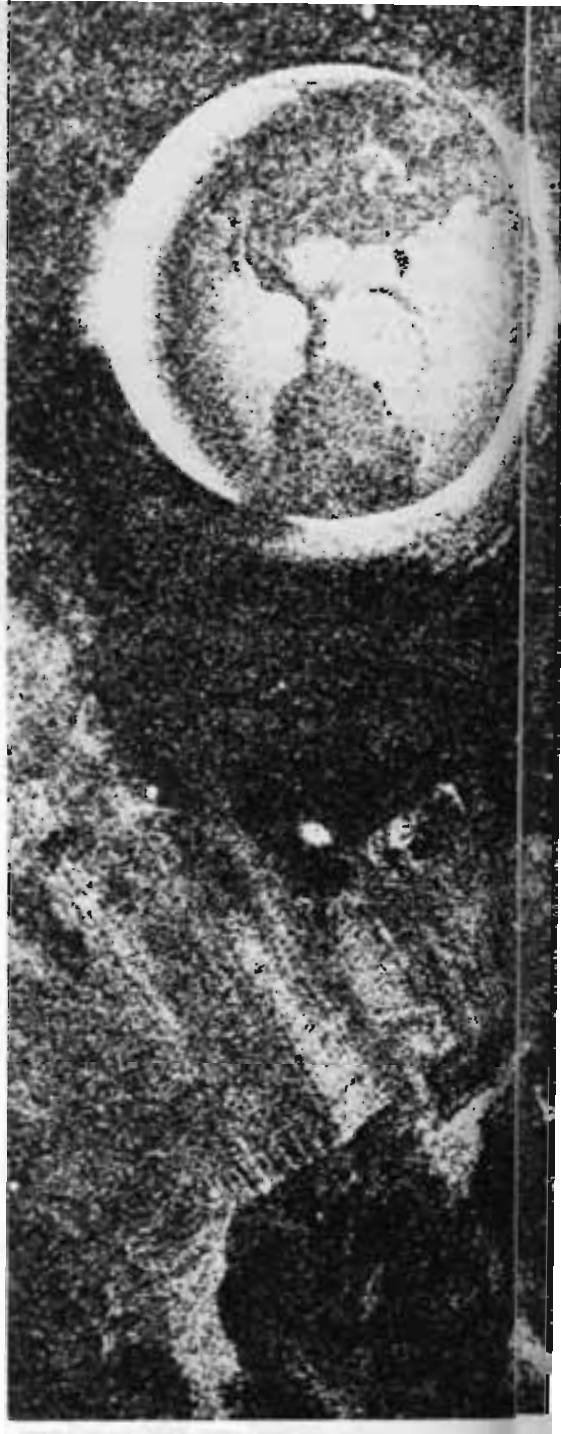
A Signal Corps space odyssey

Part II-

SCORE and beyond

by Brig. Gen. H. Mc D. Brown (retired)

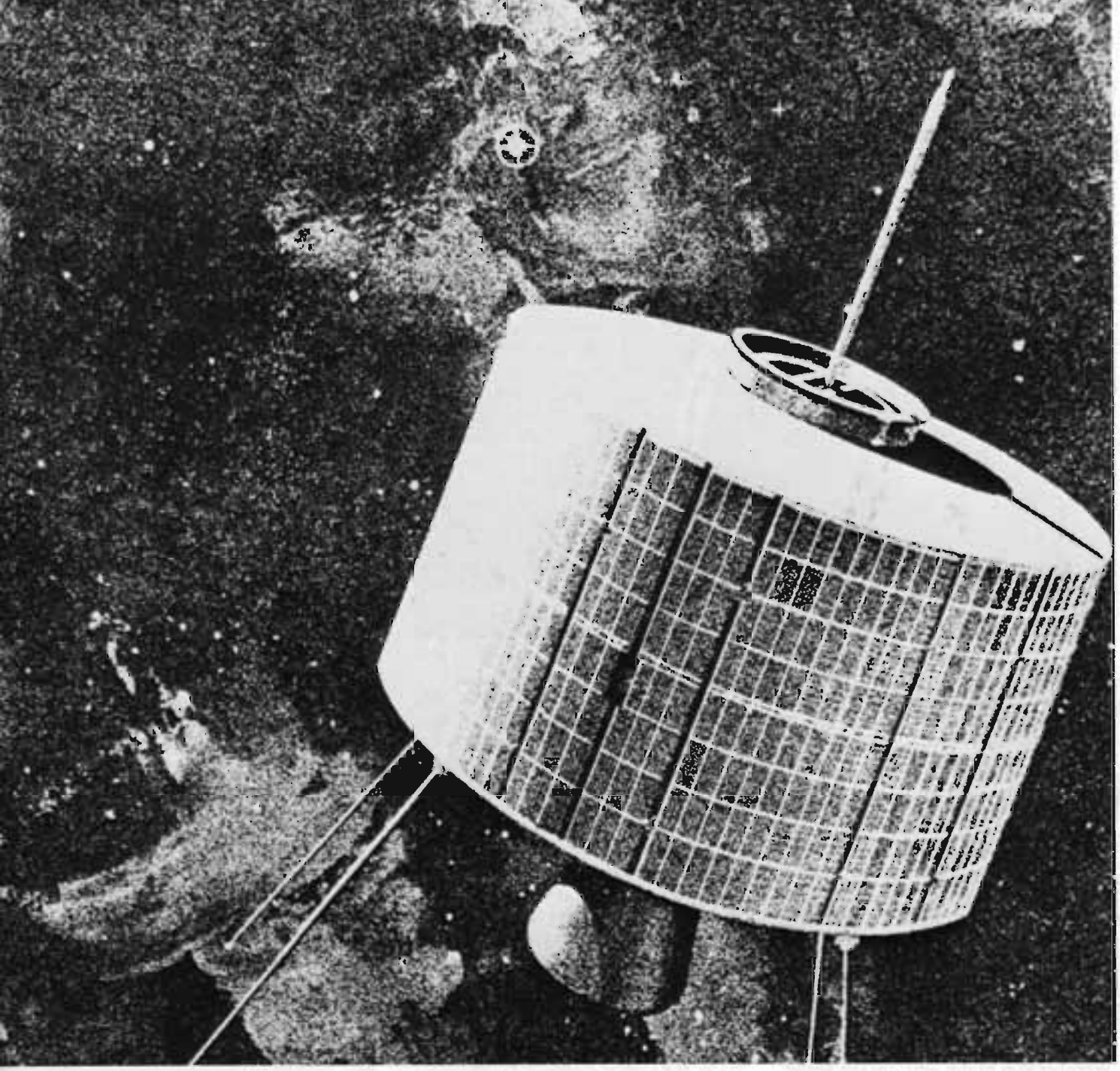


"This is the President of the United States speaking. Through the marvels of scientific advance, my voice is coming to you from a satellite traveling in outer space. My message is a simple one: Through this unique means I convey to you and all mankind, America's wish for peace on earth and good will toward men everywhere."

— President Dwight David Eisenhower, December 19, 1958

This is the story of SCORE, the world's first communications satellite and the final phase of other pioneering contributions of the Signal Corps to the early space age. They all, and particularly SCORE, represent some of the Signal Corps' most memorable achievements. It has been said that "success has a thousand fathers but failure is an orphan;" and SCORE, COURIER and TIROS were all remarkable successes!

As a major participant in these projects, I would like to share with all Army communicators, young or old, my recollections of what really happened without going into nitty-



gritty technical details which have been published widely in the open literature.

In 1958 I was a colonel assigned to the Army Electronics Proving Ground (AEPG) at Fort Huachuca, Arizona. I was nearing the end of a tour of duty as chief of the Electronic Warfare Department when I received a telephone call from Maj. Gen. Emil Lenzner in the Pentagon. Lenzner had been Commanding General of the AEPG but had recently gone on to the Pentagon where he had become the Deputy Chief Signal Officer.

Lenzner's call was to set in motion events which brought me to the most exciting, most satisfying and best tour of duty of my entire thirty year military career. He told me that the Chief Signal Officer, Gen. O'Connell, wished to know if I would like to be assigned as the commanding officer of the Signal Research and Development Laboratory (SRDL) at Fort Monmouth, N.J. I had been assigned to Fort Monmouth before and although I was surprised at being considered for such an assignment, a friend, Brig. Gen. E. F. Cook, had commanded the laboratory for the previous three years and I knew he had enjoyed the assignment. So I told General Lenzner I would like to accept.

Command assignment to an R&D laboratory is uniquely different in two aspects from any other regular military command duty. First, a laboratory of a predominantly civilian workforce of scientists and engineers, including a scattering of professionally prominent prima donnas, cannot be managed like a troop command. More freedom of action and a relaxed military discipline must be granted to keep them motivated and productive.

Second, whereas a commander of regular military activities can observe the effects of his decisions mostly on a day by day basis, in a laboratory the results may not come to light for a long time, often not before his departure to other duty since the complex process of

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R&D takes a long time from initiation to completion — which leaves a lot of room for arguments of fathership for both good and bad ideas. At any rate, the commander of an R&D activity faces some rather unique peculiarities, which call for unorthodox management approaches and sometimes seem to create odd sentiments in command transfer and succession not prevalent in other military assignments.

But let me come to the main subject: SCORE. Right from the start of the satellite program in 1955, the Signal Corps — and particularly SRDL — had been crusading through proposals, presentations and recommendations for the early utilization of satellites for its communications needs. The basic idea was by no means new. In science fiction stories, satellites had long been loaded with communications gear and realistic and detailed theoretical studies existed in the open literature since 1952. But something practical had to be done about it now.

The IGY program strictly ruled out any applications tests and consequently our sights had to be focused on the military satellite programs which were expected to follow. In this respect, we hoped that our close relationship with the Army Ordnance Corps and the ABMA, for which we provided significant support in electronics, would secure us priority consideration in their planned programs. But that was not so. Gen. J. B. Medaris as well as Dr. Wernher von Braun were not too keenly interested in communications satellites. Although they appeared fully confident of the soundness of the principal and of their future importance, they felt they had, at that time, not enough appeal to impress the nation and Congress sufficiently to give urgently wanted greater support to space programs. After all, the general public probably couldn't care less whether a telephone connection was provided by cable, ground based radio, or satellite relay until satellites would make possible real-time global TV transmission which low altitude satellite orbits could not yet offer. Medaris felt that highest priority belonged to an eye in the sky surveillance satellite which would stun the nation and the world by furnishing detailed pictures globally.

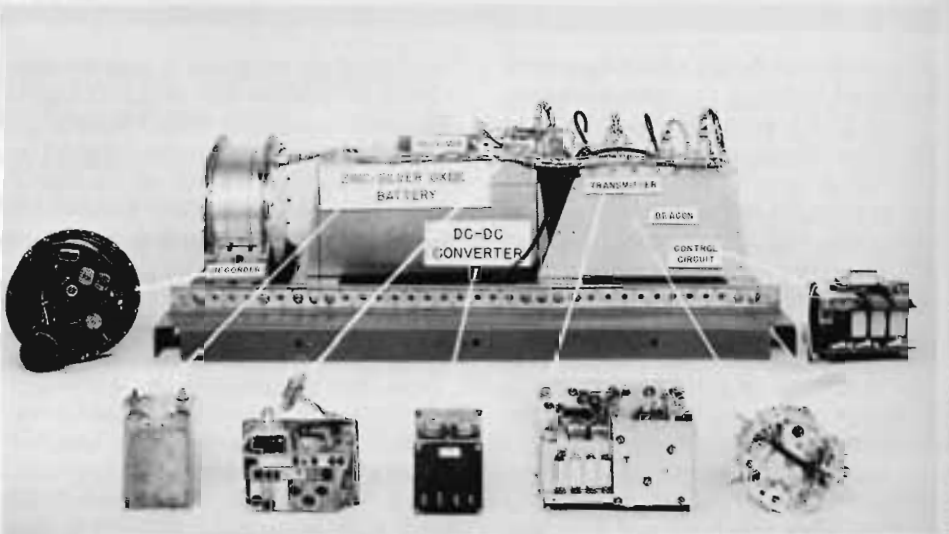
Nevertheless, we were promised a piggy-back ride for communications equipment when extra weight on another main payload should become available. But, assisted by the chief signal officer, we kept our eyes wide open for other and earlier opportunities which, fortunately, would soon develop.

On 29 May 1958, we had a visit from the Secretary of the Army, Wilbur Brucker, who was accompanied by Gen. O'Connell and in our briefings we made a strong pitch for communications satellites, which seemed to impress Brucker.

As a consequence, Gen. O'Connell came back for another visit on 23 June. This time he brought with him the director of ARPA, Roy Johnson. Fully aware of Johnson's sweeping power in the satellite field, we made an all out effort to convince him of the urgency of communications satellites as a matter of national emergency. We did not have to wait long for the gratifying result. Within a few days, we received an urgent telephone call from the office of the chief signal officer, prompted by ARPA. It requested a quick answer to what kind of satellite communications equipment we could put together in 60 days if we were allowed a weight of 150 pounds on a rocket which would be sent into orbit. The SRDL workforce, well-prepared for such an opportunity, responded promptly with design plans and presentations, and in early July we received ARPA authorization to proceed. Thus project SCORE was born.

The project provided for an Air Force Atlas ICBM to be launched from Cape Canaveral, Florida. Since the entire one-stage rocket of some 9000 pounds was to be placed into orbit, no separate satellite payload configuration was planned and the communications equipment was to be properly integrated into the fairing pods of the missile. A relatively low orbit and a correspondingly short life expectancy of this satellite of some 2 to 3 weeks, called for the use of battery power rather than a long-life solar power supply.

In view of the relatively low orbit expectation and the related limited opportunities for simultaneous access to the satellite from various ground stations, the SRDL-designed communications equipment included a store-and-forward mode through a tape recorder subsystem in addition to a real-time radio relay capability. Thus, even for the low orbit, worldwide delayed message delivery or "courier service"



The world's first satellite to relay the human voice through space was placed in orbit on 18 December 1958 through Project SCORE. President Eisenhower's Christmas message proved that voice and code could successfully be relayed or stored and forwarded by satellites over tremendous distances.

could be demonstrated. Considering the risk of a communications package which included electromechanical devices, such as a tape recorder, it was decided to provide redundancy by orbiting two independent copies of the equipment. The capacity of the system was one voice channel or seven 60 wpm teletype channels, frequency division multiplexed. The tape recorder had a four-minute capacity for either recording or playback.

To accomodate the 30° south inclination of the projected orbit, special ground stations for satellite interrogation and communications had to be located at Fort McArthur, California; Fort Huachuca, Arizona; Fort Sam Houston, Texas; Fort Stewart, Georgia; and Cape Canaveral, Florida.

As this project — sponsored and funded by ARPA with the Air Force having vehicle responsibility and the Army Signal Corps in charge of the payload — proceeded in deep secrecy, the 60 day deadline was soon extended to 90 days as the Atlas schedule slipped. The timely completion of our own part was aided by contractual industry assistance by RCA and others. The integration of missile and payload required close cooperation between Air Force and Signal Corps.

But in September 1958 (incredibly to us) we received word from ARPA that the project had been cancelled. The cancellation was followed by a directive to continue the work with no change in deadlines as an important exercise for the purpose of using the equipment for communications tests in helicopters, airplanes and other flying devices short of satellites.

Actually the "cancellation" was only a ploy to shroud the project into super secrecy. When it happened, we could not understand the underlying reasons. It was later explained that President Eisenhower, angered by security leaks on other space vehicle launches and associated embarassments, had threatened ARPA with actual project cancellation should any information leak out before the launch of the Atlas. As a result, only those individuals at ARPA, the Air Force and the Army qualified for a "need to know" since failure to inform them could have directly endangered the timely completion of SCORE. The 88 people who were selected to know became the now famous "Club 88."

Dr. Hans K. Ziegler (left) and then Col. H. McD. Brown (right) talk with Dr. Werner Von Braun after one of his visits to USASRDL, Fort Monmouth, New Jersey, 13 November 1959.

Maintaining the super secrecy over almost three months was quite difficult and caused much confusion, especially in the preparation of the ground stations. At one point I was told that Maj. Gen. F. Moorman, the CG of the AEPG at Fort Huachuca, threatened to have our people evicted from his post by the MPs unless he got some explanation of our clandestine activities.

Finally, the Atlas with its SCORE payload was standing on the launching pad at Cape Canaveral, ready to go.

But then one more unexpected problem developed. To start off the SCORE operations, we had prerecorded a message into the tape recorder. It was a paragraph from a nonpolitical, patriotic document of US history and nobody seems to recall any longer what it actually was. The late Herbert Hawkins, a member of the SRDL-SCORE team, who had a very pleasant voice, had recorded it and it was also contained in teletype mode.

Now, just hours before the takeoff, another tape recording was hurriedly brought to Cape Canaveral, which was to replace the one already in the recorder. Roy Johnson, who had kept President Eisenhower well informed on progress, had in a last minute effort succeeded in convincing the President that SCORE would be a splendid opportunity to broadcast a Christmas peace message to the world and here it was. Since there was no longer any physical access to the SCORE equipment at the pad, the substitution of the prerecorded messages had to be done by radio interrogation and transmission with the risk that the ever alert news media might intercept it and prematurely publish it. But in the wee hours of Thursday, 18 December 1958, the Signal Corps team succeeded in this tricky task.

At 1802 hours, the long awaited launch took place with everyone full of anxiety over the outcome. How great was the joy when the tracking data confirmed within minutes of rocket burnout that orbiting had been successful. The Air Force had convincingly proven the capability of its Atlas ICBM. But, we wondered, would our communications equipment be equally successful?

The operational plan called for interrogation on the first orbit by the California ground station to receive and record the President's message and at once transmit it by telephone via the Pentagon to the White House for public

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release. But interrogation of the first of the two SCORE packages was responded to only by a transmission of an unmodulated carrier and the quick switch to interrogate the second package obviously was too late to produce conclusive results during the first orbit. Though we were not fully discouraged by this result, we nevertheless spent a sleepless night and anxiously waited for the twelfth orbit which would be suitable for another chance of interrogating the second SCORE package. This occurred at 1515 hours on 19 December and was accomplished by our SRDL team at Cape Canaveral. The message came down loud and clear from the satellite:

This is the President of the United States speaking. Through the marvels of scientific advance, my voice is coming to you from a satellite traveling in outer space. My message is a simple one: Through this unique means I convey to you and all mankind, America's wish for peace on earth and good will toward men everywhere.

During the next two weeks, the second SCORE package continued to work perfectly in 78 interrogations in all modes of communications — real-time relay over long distances and store-and-forward on a global basis, both in voice and teletype. The first package failure was later diagnosed as a malfunctioning of the tape recorder, probably by the jamming of a take-up reel. How fortunate that we had worried along these lines and provided equipment redundancy.

The Army Signal Corps had really done it again! Almost one hundred years after it had given our country its first primitive network of telegraph communications, it had pioneered the nation's and the world's first communications satellite, demonstrating almost unlimited potential.

Needless to say, we at SRDL were immensely proud and naturally we were also looking forward to credits and recognition for the dedicated efforts and the untiring crusade which had led to this achievement.

The President had shown great interest in the project and the newspapers reported that he was in high spirits when he joined reporters in the office of the White House Press Secretary to listen to his tape message as retransmitted from space. Of course, the event represented two different significant milestones in our national progress: The Atlas ICBM had placed into orbit the largest satellite ever launched, which at almost 9000 pounds was just about three times as heavy as the heaviest Russian Sputnik III and which renewed our confidence that we were well on our way, both for space and defense goals. And then, of course, there was the world's first communications satellite.

The President, in general terms, congratulated all involved in both milestone achievements and there were many who had to share the credit in ARPA, the Air Force, the Army and its Signal Corps and in the US industry. We did not necessarily expect nor did we receive any specific congratulatory reaction from the White House.

Most gratifying, however, the news media gave the Army Signal Corps' contributions excellent coverage, which should have been properly reflected later in the records of space history, but obviously was not. Moreover we received numerous congratulatory telephone calls and letters from both military and civilian professionals.

But what we most expected was some official recognition from our own bosses: the Army and the Signal Corps, which had not yet materialized. Then we heard some rumors of a Pentagon snafu which could have been the reason. There were several versions of how Secretary Brucker in the confusion of the project's super secrecy had unfortunately been left uninformed and had heard of its completion only afterwards through the news media, which made him very unhappy, if not angry with his Signal Corps.

Actually, as Gen. O'Connell revealed at a later date, this is what happened: Secretary Brucker was on the list of the "Club 88" and a member of his immediate staff was supposed to keep him posted. But in the last phases of the project this was overlooked somehow. He became aware of the completion of the project on the evening of 18 December only when a news reporter, who had somehow picked up some information on our failure to successfully negotiate SCORE on the first orbit, called up the Secretary at his residence and tried to get an explanation. The Secretary was indeed angry and immediately summoned O'Connell for an explanation.

But our assumption that this was why we had gotten no reaction from our bosses during the 1958 holiday season was dead wrong. It turned out that on Monday, 22 December — the first working day after the SCORE announcement on Friday, 19 December — Secretary Brucker had written a most complimentary letter of congratulations to the chief signal officer to be conveyed to all participants of SCORE. O'Connell immediately endorsed the letter, added his own specific additional congratulations and dispatched it through channels to me. And there, in the channels, was where it got stuck until it reached me (quite anticlimatically) on 5 January 1959.

ARPA recognized all our members of the "Club 88" with an appropriate scroll and, although I do not clearly remember the details, we were congratulated by Roy Johnson through other means. ARPA further initiated an action which could be interpreted as a significant recognition of our professional competence at SRDL. Right after the holidays, Johnson approached Gen. O'Connell for his consent to invite Dr. Hans Ziegler, our key civilian in all our space activities, to join ARPA and to become the prestigious director of its Communications Satellite Division. Although he realized the loss for the Signal Corps, O'Connell felt that filling such a position with an individual of proven competence and an understanding of the Army and Signal Corps capabilities, would be desirable and he gave Johnson the go ahead.

Let me digress for a moment.

Dr. Ziegler, like Dr. von Braun, had been transplanted to our country after WWII as one of the prominent German scientists and engineers. He brought with him broad experience in many fields, but during the last phases of the war he had attained prominence in electronic fuse and proximity fuse concepts. When he arrived on assignment to the Signal Corps at Fort Monmouth there was not sufficient

The Signal Research and Development Laboratory (SRDL) was based at Fort Monmouth and housed in this huge hexagon in the Charles Wood area of the post. (US Army photograph)

activity in this special field, but the laboratories had other important tasks in mind for him and he was assigned as Scientific Consultant to the Power Sources organization.

Not long after Ziegler's arrival, the Signal Corps got into a hassle over his assignment with Gen. Lucius D. Clay, who was Commander in Chief of US Forces in Europe. Before receiving the Army offer, Ziegler had been contacted by the Georgia Institute of Technology to join their faculty. Now, Georgia Tech accused the Army of having gotten wise to their negotiation through the still existing mail censorship and having had him snatched away. Clay, an alumnus and loyal supporter of his alma mater, wrote a letter to the chief signal officer requesting Dr. Ziegler's immediate dispatch to Atlanta. But the commanding officer of the labs at Fort Monmouth (Col. P. L. Neal) felt this was an appropriate point to demonstrate our American principle of freedom of decisions and he left it up to Dr. Ziegler to stay or to leave. Since he was already deeply involved in solving Signal Corps problems, he preferred to stay and for 8 years he successfully conducted research in power sources areas. During this period he had often expressed to the laboratory's director of research, Dr. H. A. Zahl, his sincere desire to get into greater technological challenges, should opportunities arise. The opportunity arose in June 1955 when the labs got involved in space activities and Dr. Zahl drafted him immediately as a special assistant for this new mission. Shortly thereafter, he was named assistant director of research. When, during the following three years, the Signal Corps space efforts took on momentum, he became the key civilian in charge of all these programs and he represented the Army and the Signal Corps in related high level national and international conferences. He was, in fact, appointed by the National Academy of Science as a US delegate to the IGY conference at Moscow.

When I arrived on the scene, he enjoyed under the title USASRDL Coordinator for Space Age Activities unusual broad authority to cut across existing organizational lines to get all projects — most of them requiring services from a variety of laboratory elements — accomplished on a crash basis. Although I was well-impressed by the skill and effectiveness with which all this was accomplished, I felt that on the long run, this modus operandi was not the proper way to cope with an obviously emerging new long term Signal Corps and SRDL mission. I felt the new responsibilities had to be reflected in the creation of a new operational element in the laboratory's organization. I soon had some firm ideas about how to do this, but did not want to interfere while SCORE was in progress.

Shortly before the completion of SCORE, I disclosed to Dr. Ziegler my plan to concentrate all SRDL space activities into a new Astro Electronics Division, comprised of appropriate elements which would be extracted from the overall SRDL manpower and equipment resources and in which he would be offered the directorship. He did not seem to like it too much since he felt quite happy in his present role. But when I frankly told him that after establishment of the new division, no one on my staff would have much to say in space matters, he joined my plan. There was one more crisis on the morning of the launch day of SCORE. When I had permission to let him finally

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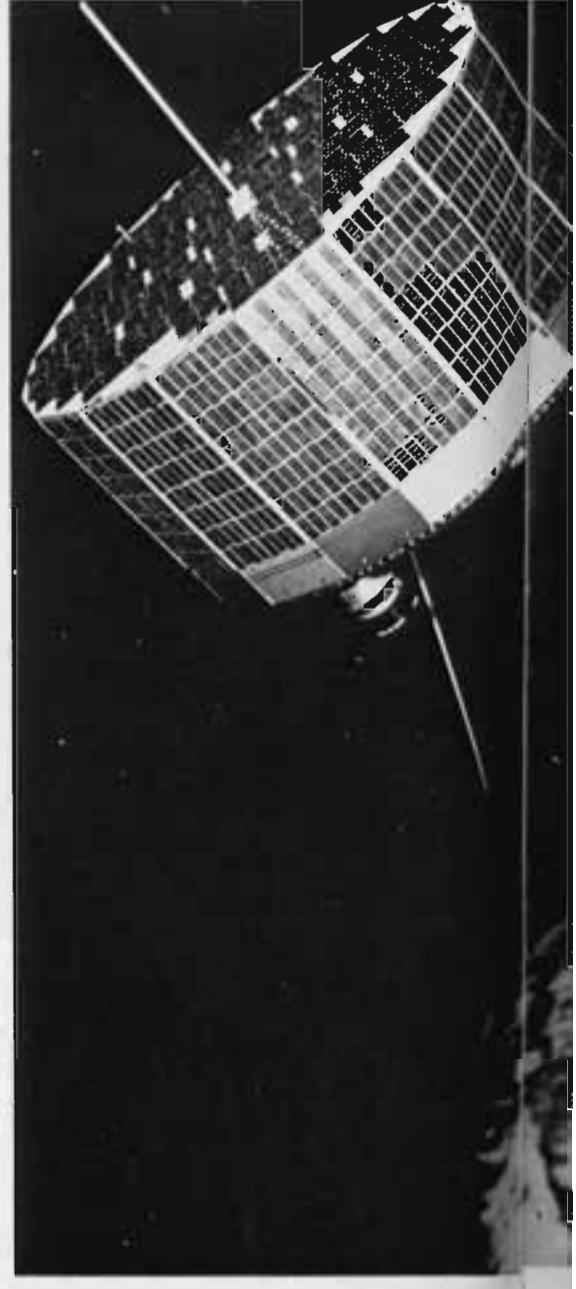
know about the secret — in spite of his key role, he had not qualified originally for need-to-know since the project had already reached the point where it no longer depended on his involvement — he was very disturbed and felt he had to interpret the whole thing as an expression of lack of trust in his integrity by top government echelons and that he should promptly resign. But eventually I succeeded in explaining the situation to his satisfaction and he was ready to assume the directorship of our new division.

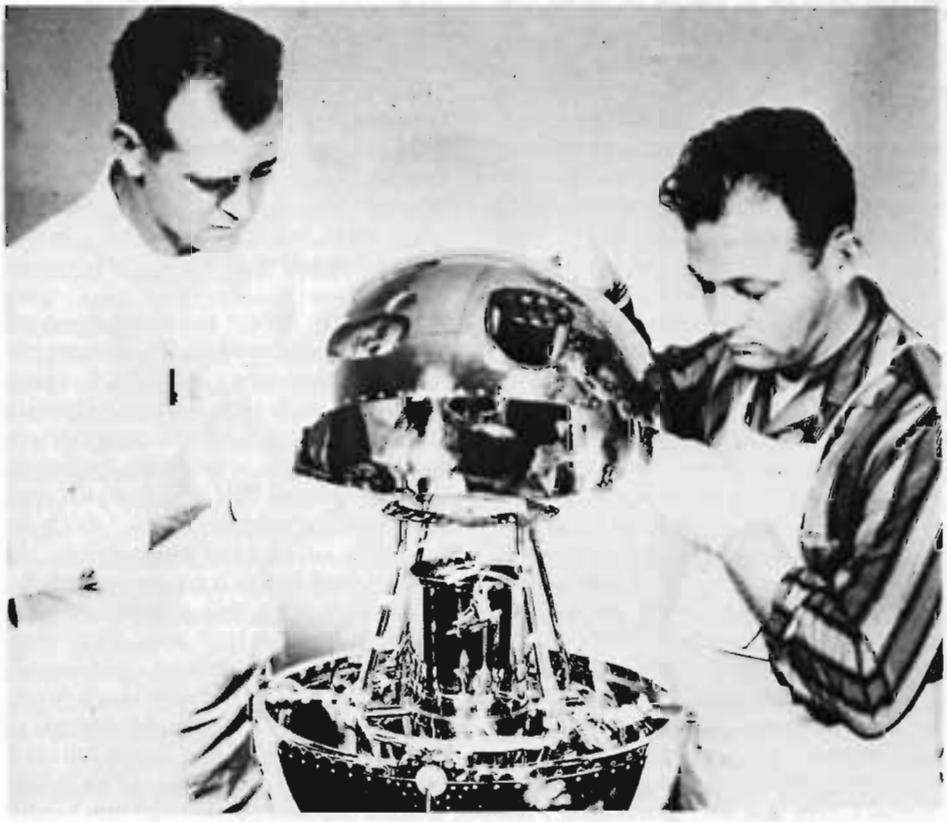
Just then, in the first days of January 1959, he received that attractive offer from Johnson. But he did not take it. After his own thorough analysis of the responsibilities he was to take at ARPA at that time and of the future outlook of the role of ARPA and after explaining these viewpoints to the chief signal officer, he declined. In February 1959, he was appointed as director of SRDL's new Astro Electronics Division.

The ARPA offer and my own dim appraisal regarding the longevity of our SRDL space involvement in the light of increasing three service competition and the emerging role of NASA, prompted me to take steps to secure Dr. Ziegler's valuable service for SRDL on a longer range basis. SRDL had on its approved organization table a position of a chief scientist, who was the top civilian directly reporting to the commander. This position had never been filled and I immediately pursued necessary efforts at the Pentagon to have it filled by Dr. Ziegler. It took nine months to accomplish that goal and on 7 August 1959, I had the satisfaction of installing Dr. Ziegler as the first and only chief scientist the laboratories at Fort Monmouth ever had.

I should add here that his appointment was without any campaign or political Pentagon crusade from his side; it was strictly on the basis of his proven competence and performance. I only assured myself of his willingness to accept and conducted the Pentagon battle on my own. Later on, after the Army's reorganization in 1962/63, he was asked to take over the greater responsibility of chief scientist of the entire newly created US Army Electronics Command (ECOM), where he successfully served for many years. I greatly enjoyed working with Hans and he was of great help to me during my tour of duty.

Since I am talking about people who were of great help to me, I would be greatly remiss not to mention my deputy commander, Col. John E. Watters, who was always a tower of strength. With unfailing good





Vanguard II was successfully launched 17 Febraury 1959. But a mishap during the final orbit insertion made the cloud-cover payload virtually useless. Ironically, the payload's electronics performed perfectly for the 18 days of battery life.

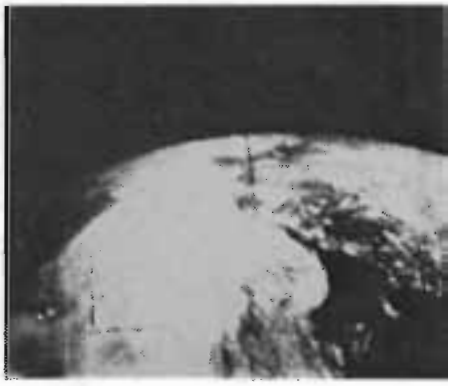
judgement and a firm, experienced hand, Watters handled literally every type of problem imaginable every day and he did it with great insight and good humor. His many talents were fully tested in this challenging assignment, which some of us likened to being a chaplain in an insane asylum. It must thereby be realized that the chapter of space activities, singled out for special discussion in this article, represented but a small fraction of the overall mission effort conducted by the 3500 personnel at the laboratory complex.

As we entered 1959, our space contributions continued.

After four failures since April 1958 to place a full size instrumented payload into orbit, the last of them containing the SRDL conceived and developed "cloud-cover" instrumentation, Vanguard was ready on 17 February 1959 to make another try. It was successful and the Vanguard program had finally delivered the first of the long overdue originally planned IGY satellites. It was designated Vanguard 2 and carried the backup model of our cloud-cover instrumentation.

But while successful physical orbiting of the 22-pound payload was demonstrated, a mishap during the final orbit insertion made the payload virtually useless. The satellite had already been separated from the burnt out last stage rocket and was perfectly on its way when residual fuel in the rocket reignited and propelled it forward, kicking the satellite in the back and sending it tumbling erratically. The cloud-cover imaging concept was based on scanning the earth in circular sweeps with photoelectric sensors as the rotating satellite moved along its orbit. Therefore, the now irregular tumbling motion made image computation impractical. Ironically, the payload's electronics performed perfectly for the 18 days of battery life, but in spite of desperate attempts to derive images from the data, through simulation and computer programs, the effort had to be given up finally.

But a much more sophisticated cloud-cover and meteorological satellite was already coming along: TIROS (Television and Infrared Observation Satellite). This satellite included two television cameras, one with a wide angle and one with a narrow angle view. The picture taking periods of these cameras could be preprogrammed from ground stations for each orbit to coincide with proper sunlight conditions and to achieve coverage of desired parts of the globe. The pictures were stored on magnetic tape and transmitted to ground terminals upon interrogation, but also a real-time TV capability was provided.



In 1960 TIROS I (far left) took these two photographs among many others, from several hundred miles east of the Atlantic coast from an altitude of about 450 statute miles. The photos were sent by tele vision to Ft. Monmouth and then transmitted to NASA, which conducted the TIROS project.

In addition to the TV feature, the system included infrared sensors for various wavelengths to obtain overall heat balance measurements and coarse IR images using a scanning concept similar to our cloud-cover instrumentation.

Actually the TIROS did not originate at SRDL, nor was it an SRDL design — although we were involved in many planning phases and in the final design stages, especially in the IR subsystems.

The project had come a long way from ABMA, where it was derived from Gen. Medaris' ambitious "Eye in the Sky" surveillance satellite concept and had resulted in a contract with the RCA, Princeton. In July 1958, ARPA placed the technical direction of the development and production of the TIROS payload by RCA into the responsibility of SRDL.

ARPA's sponsorship was later transferred to NASA and when TIROS I was successfully launched on 1 April 1960, it was under the auspices of NASA. All systems operated perfectly and flooded the meteorological community with a total of 22,952 cloud-cover pictures.

The final management of the TIROS project represented a rather complex picture. The Air Force Ballistic Missile Division was in charge of the launching vehicle and the

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operation of a ground terminal at Hawaii; the Signal Corps was responsible for the payload and the operation of a ground terminal at Fort Monmouth. The overall operational phase was directed from the Space Operations Control Center of NASA, with the NASA Computing Center and a Weather Bureau Meteorology Satellite Center, both in Washington, D.C., playing a major role.

The results of the TIROS were most gratifying and fascinating. Besides the cloud formation, the first set of pictures — depicting a sweep along the east coast — clearly showed the contours of the coast and the St. Lawrence River.

These first pictures were immediately flown to Washington where the head of NASA presented them to President Eisenhower for public release. Later, even more impressive images were obtained from many parts of the globe, among them pictures of the Baja California Peninsula and the Suez-Canal-Red Sea area which are still vividly in my memory.

We received fair credit for our contributions through the news media and some official channels, but were muzzled by NASA in the release of any information or results from our ground terminal at Fort Monmouth. We ended up as mere messengers to deliver the goods for further analysis to the various centers.

My contacts with NASA officials at that time were not particularly pleasant. On the very first day of TIROS operation, after some congratulatory pleasantries in a telephone call, the head of NASA accused us of having leaked information on Signal Corps participation to the UPI without his specific authorization. It was quite obvious that the Signal Corps' role in the project was to be subdued. Other conversations with NASA people led me to the strong belief that a determined trend was in the making to reduce and erase the credits of the military services on their pioneering space accomplishments. I even came to the sad conclusion that this was done with the knowledge or consent of the White House to ascertain quickly a prominent role for NASA as the newly established civilian space agency.

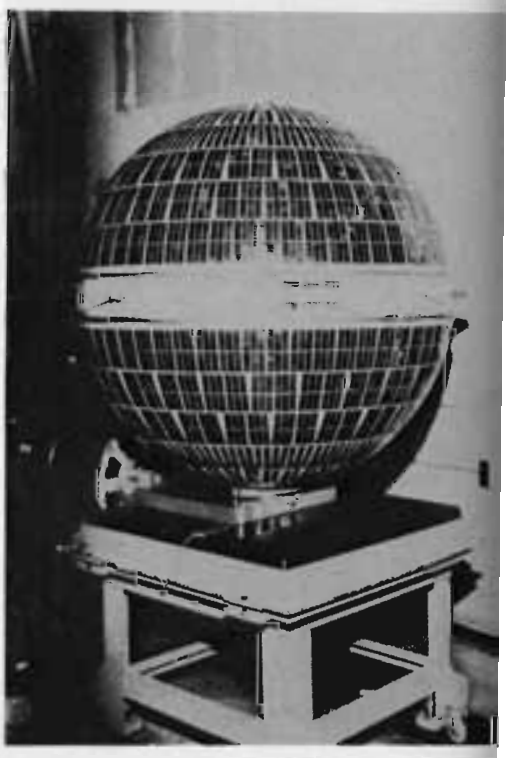
Nevertheless it was our gut feeling that we had made significant contributions to the meteorological satellite development both in the concept of our first cloud-cover instrumentation and our technical directorship of the TIROS payload.

Before we had to experience some more frustrations, we were fortunate to further advance the communications satellite development. Already in September 1958, while the SCORE project was in progress, SRDL submitted to ARPA a technical proposal of a similar but greatly expanded and much more sophisticated store-and-forward, or delayed repeater, system named COURIER, which called for a 500-pound satellite. ARPA operated, and through their authority covering all three services, they were in a position to select one favorable subsystem from one service and marry it to a timely available favorable subsystem of another service. This is what had happened in SCORE, and for COURIER, the Army Signal Corps payload was again scheduled for an Air Force vehicle.

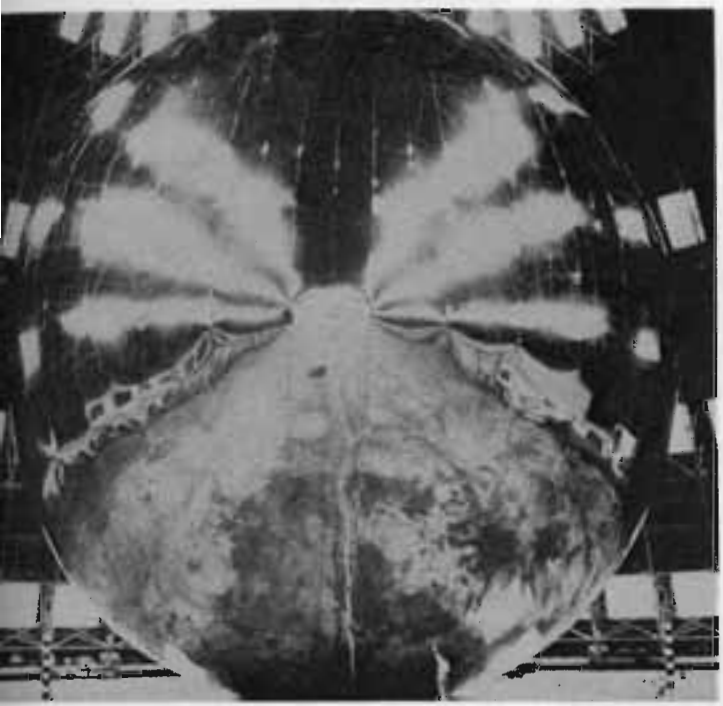
This concept did not please Gen. Medaris. Unfortunately, however, top government decisions had not favored Army space vehicle developments in spite of their pioneering role and demonstrations of capabilities.

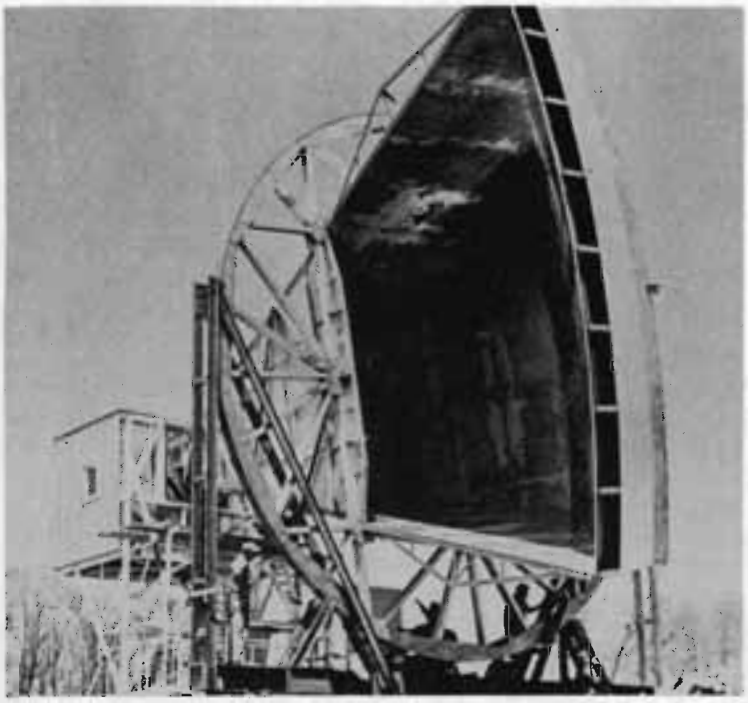
The COURIER I B satellite, which provided basically the same communications modes as SCORE, plus facsimile, but with an immensely larger capacity, was successfully launched from Cape Canaveral on 4 October 1960. An earlier launch attempt in August had resulted in vehicle failure. The tremendous communications capacity can probably be best dramatized by the fact that it could carry the text of the entire Bible and communicate with ground terminals at an effective message transmission rate of 55,000 bits/sec. It was also the world's first communications satellite equipped with a complete long life solar power supply, using approximately 19,000 solar cells and associated nickel cadmium storage batteries. As had SCORE, the satellite carried a patriotic message by President Eisenhower, which — in view of the large satellite capacity — was accordingly longer. The Philco Corporation was the prime contractor on the project.

The COURIER system operated perfectly in all modes and practical Signal Corps use was envisioned particularly for the large volume logistic overseas traffic. But after 228 orbits in 17 days, somehow we were no longer able to interrogate, although the electronics seemed to be in working order. No conclusive failure diagnosis was ever achieved, but we speculated that we had lost the access code. Because of a disturbing experience with SCORE, which had a simple access code and obviously could be triggered accidentally by FM broadcast



COURIER IB was an advanced communications satellite for its time (1960). It could see, it could speak and it could remember. But after 228 orbits in 17 days, technicians were no longer able to communicate — although the electronics seemed to be in working order.





The 100-ft. aluminum-coated sphere (above, left) of Project Echo orbited at 1,000 miles altitude. It had two tracking beacons, and the aluminum coat provided radio wave reflectivity of 98 percent up to frequencies of 20,000 mc. Scientists armed the 50-ft. long horn reflector receiving antenna (above) directly at the orbiting sphere.

transmissions, COURIER was endowed with a highly sophisticated interrogation system, including a continuous code change by an advancing clock. Therefore, it is not impossible that the ground stations got out of step with the satellite subsystem and were never able to find the way back. But nevertheless, data and lessons learned with COURIER would greatly benefit further advances in communications satellites.

In 1960, the Army Signal Corps had its Centennial Anniversary and its recent contributions to the space age had further enriched its proud history of technological progress.

Many celebrations were being planned. Within their framework, we felt that it would be entirely appropriate to request the Post Office Department to issue a commemorative stamp. Other organizations had been honored in the past at their centennials such as the American Institute of Architects in 1957, the American Chemical Society in 1951 and the American Poultry Industry in 1948. The Signal Corps pursued this goal through every possible official and unofficial channel, at every possible level, including the White House and was even able to offer excellent designs from our outstanding Signal Corps artist Harold Christenson. But we were denied the honor. The only explanation given was that too many stamps had already been scheduled for the year 1960! (I am alleged to have said: "They can go to Hell in a wicker basket," but I can't remember if I did!)

Dismayed as they were by the Post Office decision, the faith of the SRDL people in their government's fairness to recognize accomplishments was completely shattered when (in spite of an "overcrowded" stamp schedule) a commemorative stamp honoring the NASA ECHO satellite was issued 15 December 1960. To add insult to injury, the ECHO satellite was credited in the Post Office publications as the World's First Communications Satellite, entirely ignoring the Signal Corps' and SRDL's first which had been firmly established two years earlier.

The issue of the ECHO stamp caused an uproar of protests by our dedicated people at SRDL. When we started preparation for a strong complaint, we soon found out that no government agency complains to another without moving through miles of red tape. Dr. Ziegler decided, therefore, to launch the complaint to the Postmaster General in his capacity as a private US citizen. An assistant of the Postmaster General replied that the matter has been referred to NASA, which was the last we ever heard of it.

In the meantime, reputable publications, like the *Life Science Library* books, picked up the erroneous Post Office information. Based on another private effort by Dr. Ziegler, however, the editors took prompt steps to make corrections.

The case with the Post Office was reopened in 1964. Dr. Ziegler had the opportunity to appear before the President's Science Advisory Committee and he included in his prepared statements a reference to the stamp controversy as a typical example of the mishandling of accomplishment credits of government personnel. He again privately complained to both the Postmaster General and the administrator of NASA. This time success was at hand. The NASA reply pointed out that they had never claimed that ECHO was the first communications satellite but only the first man-made passive communications satellite and that it was all the Post Office's fault that the error was spread. On the same day, the Post Office thanked Dr. Ziegler for bringing the error to their attention and proposed to identify ECHO I in future publications "as the world's first passive communications satellite." Finally the case was settled, but the damage had been done. The erroneous

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identification had crept into many publications of space history. Corrections are slow in coming. In fact, some Post Office publications still contained the error in 1978!

Unfortunately, the Signal Corps missed a great opportunity in 1960 to get its success story to many millions of readers in the US and all over the world and to have it prominently recorded for history.

Dr. von Braun, with whom we had a fine working relationship and whom I have always admired as a perfect gentleman, had referred to us Cornelius Ryan, the famous author of *The Longest Day* and other WWII best sellers. Ryan had been asked by *Reader's Digest* to write a feature story on communications satellites. Consequently, he made several visits to us and spent many hours with Dr. Ziegler and others. He felt he should also go to the Pentagon to collect firsthand background material. At that time many details on satellite work were still safeguarded under security classification and he returned rather frustrated from his Washington trip, since he had not received all the desired answers. He was also told that any publication covering ongoing military R&D was by government regulation subject to prior review and editing. When he finally submitted his manuscript to Dr. Ziegler, it turned out that, based on the gaps in information withheld from him and his attempt to bridge them with his own vivid imagination, the manuscript required considerable revision. When Ryan was told about this, he was so upset that he could not get all the information he had desired and that he would be told what he could, and could not, write, that he cancelled the project. Thus, unfortunately, no *Reader's Digest* article on the evolution of communications satellites was published and a great opportunity for the Signal Corps was lost.

The future of satellite communications, we recognized, lay with satellites in stationary synchronous equatorial orbits, with fixed relationships to their ground terminals. Since launching vehicle developments quickly approached required capabilities, ARPA decided to combine the related efforts of the three military services into project Advent and assigned overall project management to the Army in a newly created US Army Advent Management Agency located at Fort Monmouth and reporting through the chief of R&D of the Army. Although this Army responsibility was already established by September 1960, the new agency was not officially activated until 27 March 1961. For us at SRDL this had a serious impact. Although we continued to be responsible for some R&D in communications satellites, the immediate need for staffing the new agency with competent similar talents required the transfer of some forty key people from our recently initiated Astro Electronics Division. In the Advent project, the Army had major responsibility for the payload and ground terminal systems, the Navy for shipboard terminals and the Air Force for the launching vehicles and related operations.

But this lasted hardly more than a year. Under the pressure of the Air Force to include the satellites into their mission, the Army's responsibility was reduced to ground terminals and ground support. In May 1962, the Army agency was renamed the US Army Satellite Communications Agency (SATCOM). With this change, the R&D mission of SRDL was also reduced accordingly and the Signal Corps no longer had any direct stake in satellite payloads, thus bringing to an end a most memorable chapter of Signal Corps pioneering efforts and achievements.

The SATCOM agency has survived all subsequent reorganizations and is still continuing to perfect satellite ground terminals for Army use, including tactical applications for the Signal Corps communicator in the field, the ultimate gratifying purpose of any successful Signal Corps technological endeavor.

NASA, originally absorbing the NACA, major parts of the Navy's Vanguard group at NRL, some parts of SRDL and, above all, the Dr. von Braun team and related Army missile elements, gradually came into its own.

Meanwhile I had gone to Seventh Army in Europe in 1961 and from there to USAREUR, back to Fort Monmouth as Commandant of the Signal School in 1964 and to the Pentagon in 1966 as Deputy Chief of Army Communications and Electronics, where I retired in 1967.

The laboratories at Fort Monmouth are still there, but after the reorganization of the Army in 1962, they are no longer an integral part of the Signal Corps and have changed their parentage in one more drastic reorganization. Some of the missions have been modified or eliminated, others have been added.

A new generation of scientists and engineers has replaced the many who have retired or passed away since I departed. Although they are no longer part of a Signal Corps activity, they represent — together with industry — the backbone of the Army R&D in the electronics and communications fields and their continued achievements will benefit the Army communicator. The memorable phase of the early Space Age has passed and the labs are now successfully penetrating the frontiers of the Computer Age.

It is gratifying to note, that just recently one of the major R&D activities at Fort Monmouth has been recognized as the top laboratory in the entire Army and has been presented with the Secretary of the Army's Laboratory of the Year Award.

Thus, while we hope the pioneering achievements of the previous institution will remain deeply embedded in the minds and hearts of Signal people everywhere, we also wish Godspeed to its successors for the continued benefit of our Army and its communicators.

AC

Brig. Gen. Brown retired from active duty in 1967 after thirty years of distinguished service. A 1937 West Point graduate, he also successfully completed the US Army Signal School (1940), Command and General Staff School (1944), Armed Forces Staff College (1951) and the Army War College (1955). Among his many key assignments are his two years as commanding general of the US Army Signal Center and School (1964-66) and his final assignment as Deputy Chief, C&E, Department of Army (1966-67). Brown, who played a central role in the initial Signal Corps space effort, resides in Edinburg, Texas.