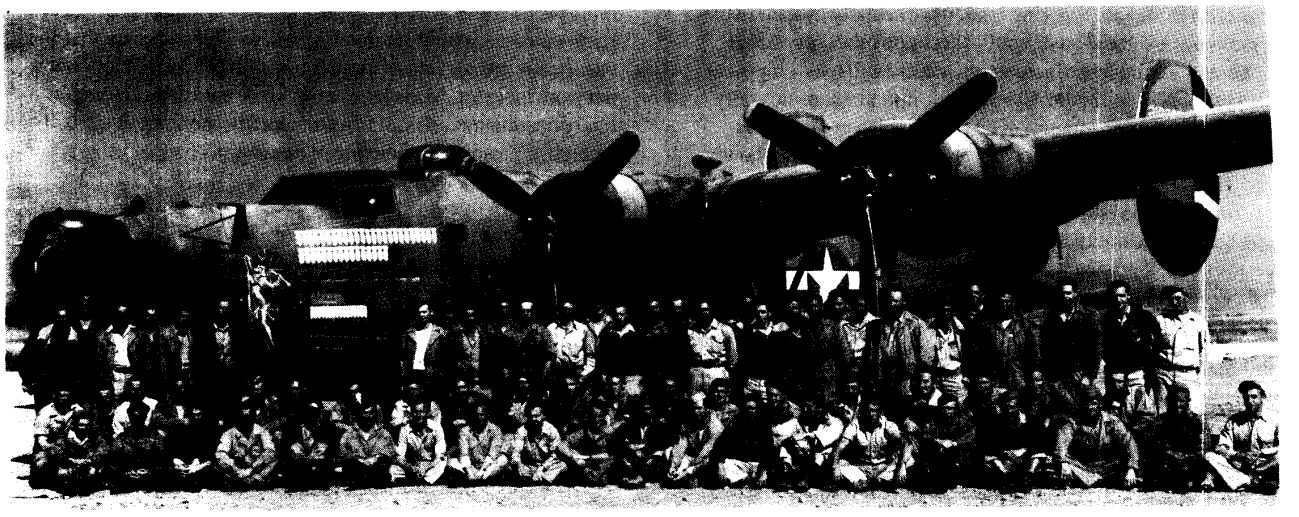


Making Technology Work in World War II

Edward G. Menaker
Life Member, IEEE

Editor's Foreword: This is the story of the use of radar in China during World War II, as personally experienced by the author. We trust that you "young-uns" (who do not remember WWII) and you "old-timers" will enjoy this piece of history laced with personal observations and photographs.

The story is printed as received from the author; it was written to record events in his life for his family, his fellow servicemen, his cohorts, and, through these pages, our readers and future historians. We hope that you enjoy this first-hand report, and sincerely wish that more engineers would record—for posterity—events in their lives that indicate the impact of engineering on society, whether in a time of peace or travail.

Author's Foreword

In a remote part of China during World War II a small band of airmen, hidden from public knowledge, played a highly significant role in bringing about victory over Japan. They represented the first major—and one of the most successful—uses of airborne radar by the United States. This is part of the story of how the group dealt with the challenge of turning the new technology of radar, which had just emerged from the laboratory, into an unusually effective weapon.

As the officer responsible for preparing for the maintenance of the equipment, implementing the maintenance and contributing the technical expertise to the planning and evaluation of the operations, I had a unique perspective on the project. My experience was a case typical of many in that war: I entered a field for which I was totally unprepared by my civilian experience; yet, I did what the war effort demanded.

Author's Current Address: 1824 Westminster Road, Waynesboro, VA 22980
Manuscript received February 9, 1993; revised January 29, 1993.
0885-8985/93 $3.00 © 1993 IEEE

"Whosoever has done me the courtesy to read my chapters which have preceded this may possibly wonder that I deal so minutely with piloting as a science. It was the prime purpose of those chapters; and I am not quite done yet. I wish to show, in the most patient and painstaking way, what a wonderful science it is . . . I feel justified in enlarging upon this great science for the reason that I feel sure no one has ever yet written a paragraph about it who had piloted a steamboat himself, and so had a practical knowledge of the subject. If the theme was hackneyed, I should be obliged to deal gently with the reader; but since it is wholly new, I have felt at liberty to take up a considerable degree of room with it.'

— *Mark Twain,* ***Life on the Mississippi,*** *Chapter X*

In that passage Mark Twain expresses how I feel about my work with radar during World War II. There have been a number of books and articles written about the history of radar during that period, but they have, for the most part, been either somewhat technical or concerned with only a single, successful, operational incident. I have seen nothing that explains how this novel technology, just emerging from the laboratory, was able to become a highly effective weapon almost overnight. Furthermore one of its most successful and dramatic applications has never even been mentioned in either the

The photo at the top is the *Monsoon Maiden* with squadron members including maintenance men. Each bomb represents completed bombing mission: each stern of a ship represents one ship sunk.

histories or the popular press. Since I had a very active role in it, I am telling you the story. It shows how organizational and human elements made the difference between success and failure in using radar as a weapon.

My preparation for radar work before the Army was minimal. Higher education had consisted of liberal arts and master's degrees from Columbia in French with some additional work toward a doctorate; then a year of teaching high school subjects in a private school and about nine months of trying to contribute to the war effort by working as a machine operator and then as a machinist in companies making parts for military equipment.

In February of 1942, at the age of 22, I was drafted into the Medical Corps for my basic training as a medical technician. I had submitted an application for Aviation Cadet training in meteorology, which had looked to me like the only way I could qualify for a Commission as an officer. After a brief assignment at an air base hospital in Maine, while I waited for my appointment as a Cadet to come through, I was notified I was to start training as an Aviation Cadet in Communications at Scott Field, Illinois, on July 8, 1942. In October after being commissioned a second lieutenant in Communications I was selected along with a number of others from my graduating class to attend radar school at Boca Raton, Florida. At the same time those in my class who had engineering degrees and a strong record at Scott Field were assigned to Harvard and MIT for radar training with the expectation that they would go into development and evaluation work.

RADAR SCHOOL

Although most, if not all, of my class of some 20 radar students at Boca Raton had come with me from Scott Field, a large proportion had some previous background in electronics. Amos Peters, a lawyer from Texas, had been a radio ham. There were some engineers. The instruction covered some theory of radar and description of specific airborne search radar equipment and its maintenance.

In our elementary lab work we connected components into circuits using wire jumpers which snapped on to terminals. I knew, however, that in real equipment connections were soldered. Other people spoke glibly about "bad solder joints" as causes of equipment malfunctions and "soldering in" replacement components. I had done plenty of woodwork and machining, but I had never used a soldering iron. I was somewhat daunted by the prospect of ever having to use one. So I arranged with our instructor to make jumpers (connecting wires) for use in our lab by soldering terminals on to short lengths of wire; thus I learned to solder.

We had a couple of flights from the Boca Raton Air Base to enable us to observe the equipment in operation. I had never flown before, but aside from a little anticipatory trepidation the experiences were unremarkable.

A few days before we were scheduled to graduate we were called together and told that there were a number of openings for radar officers in the continental U.S., to which those of us who were married would be sent. For the rest there was the risk of going overseas. I received orders sending me to an anti-submarine squadron at 30th Street Airport in Miami. We were transferred before the graduation ceremony took place

THE ANTI-SUBMARINE COMMAND

I was going to be "out on the line," the state, after more than a year of school and training, of real responsibility for keeping radar equipment functioning. And here was I, who had never fixed anything electronic in my life!

Imagine my surprise when I reported in at squadron headquarters at the Miami Airport and found almost no one there. The few people who were there told me that the air echelon of the squadron, including practically all the radar technicians and operators, were in Trinidad looking for submarines from a base there. Only a couple of the radar people had been left behind. No airplanes, no equipment. There was, however, a radar shop with a file cabinet containing documents. That was to be all I would ever know about the operations of that squadron.

For the next 30 days I went through all the file folders, reading documents. From them I was able to conjure up a picture of how radar maintenance was carried out in a tactical squadron; the inspections, identification of defects, repairs, ordering parts, scheduling personnel, etc. It was valuable. That is when I also learned about airsickness. With all our planes gone there was no opportunity to fly, and I felt somewhat cheated. So I arranged with people at another squadron on the base to go along on a flight for giving navigators and bombardiers navigation practice. When we returned from a couple of hours over Florida, we had to hold over Miami for almost two hours late in the afternoon below the clouds. Turbulent! About half of us on the plane had thrown up before we landed. Very unpleasant.

Without warning I received orders transferring me to the 17th Anti-Submarine Squadron, based at Boca Chica, Florida. Transferred with me were one radar technician and one radar operator; the latter named Sheehy. We went to Boca Chica together, probably by train.

Boca Chica proved to be a desolate key about ten miles north of Key West. I only saw one tree on the island. The air base had just been completed; the Army had activated it only a few days before, although the squadron had been in existence for some time, stationed in the Caribbean.

On arrival in the early afternoon I reported to the squadron commander, Major Harvard W. Powell. He greeted me with "I'm glad to see you. I just received this from Anti-Submarine Command HQ." It was a telegram instructing him to initiate "24-hour radar coverage of the Florida Straits" beginning at 1800 that day. When I handed the paper back to him, he asked, "Do any of our planes have radar equipment in them?" (Such was the state of knowledge about radar in the winter of 1943.) I told him I would have to look and see and went out to a hangar with my two men.

The planes proved to be B-34's, a military, more powerful version of a Lockheed commercial transport, which the Navy called the Ventura. Sure enough it had installed in it an early airborne search radar, known as ASV, the SCR-521, on which a

wide fixed beam scanned continuously one sector on each side of the plane. The planes carried depth charges.

When I turned it on, it didn't work. Not knowing what defects would be associated with the symptoms, I would have to go through the circuits painstakingly to get it fixed. Lord knows how long that would take me, but I doubted there was any chance I would have it ready for an 1800 takeoff. So I turned it over to the technician, whom I had not known before, and Sheehy. In an hour they said it was ready to go. Sheehy went to get ready to fly. From 1800 on we maintained 24-hour coverage with about four flights per day, and never missed a shift.

Appropriate inquiries revealed there were already other radar operators in the squadron; they had been idle up to then. In the next few days a contingent of technicians arrived, and I set about getting things organized—I found that the technicians and the operators were competent and diligent. Some of the technicians had had previous experience with the equipment in other squadrons. There was no need for me to apply my vast technical expertise to the day-to-day problems of fixing individual pieces of equipment.

My role, I decided, would be to do everything necessary to facilitate these enlisted men doing their jobs. Further, I concluded that my strengths did not lie in expertise in electronic theory or the philosophy of science; I should specialize in getting things done. My experience in the world of work to that point made me think that there were many people who could talk at length about how things ought to be done, but few who seemed actually able to accomplish them and carry work to successful completion.

Therefore I set about arranging for a suitable building for a radar "shack" with a 24-hour guard, getting work benches in place, procuring needed test equipment, parts and supplies. I put the senior technician, Emil Petersen, who was then, I think, a staff sergeant, in charge of the technicians. We sat down together to arrange work teams, assignments and schedules. Backing him up was our technical specialist, Waldemar (Wally) Mueller, a sergeant or staff sergeant, a graduate forester from Wisconsin who had been a ham radio operator.

Petersen deserves a little more description, because he proved the key to our operations. He was a dairy farmer from Milford, New York, and probably the most surly man I have ever known. He spoke only in growls and with sneers. He treated the other enlisted men and, indeed, me with a kind of contempt. But he was a worker. He pitched into any job with determination and didn't stop until it was done right. He worked side by side with the other men, dragging equipment around, carrying heavy units back and forth, in all kinds of weather. Never a good word to or for anyone. He drove the other men. I never saw or heard anyone indicate resentment. They respected him.

Thus we developed our organization. Petersen assigned the men to their tasks, supervised them and handled all dealings with them. He referred all the more difficult technical problems to Mueller. He dealt directly with the other enlisted men in the squadron, such as the aircraft mechanics, as did the technicians who reported to him. He reported the status of all work to me daily, told me what he needed from elsewhere, and talked over problems with me. I took on myself the job of giving him and the others the best working conditions possible, dealing with the squadron staff, air base staff, etc. Practically all the paper work of reports, correspondence, requisitions, etc., I did myself.

At best, working and living conditions were poor for all of us. The only chair we had was one I used in the area I reserved for an office, with a small table for a desk. (There were no chairs in the officers' quarters where I lived: only a table with two benches in our common room. Each room, which accommodated two men, had only a cot and a dresser for each. Such was the fortunate life we received for not going overseas.) On the wall of the radar shack we had a blackboard on which we charted the status of all the planes' radar equipment: whether it was operational, or what problems it had, who was working on it and the estimated readiness time.

Things went well, even though the equipment was extremely unreliable. The connectors on removable modules were on the rear of the units; frequently pins didn't make contact consistently, and there was no way to see if the two halves were fully mated. The standard way of attempting to correct suspected bad contact was to kick the front of the module to try to drive the connectors home. We always had the requisite-number of planes operational, and we coordinated with other maintenance personnel so that we gave priority to the planes most likely to have their engines and other systems in shape.

Conditions at Boca Chica were bad. As May approached, the weather became very hot and humid. There was no shade; no place for recreation and no provision for refreshment; no officers' club. There were days when the food supplies we had were limited to peanut butter and jam for lunch and dinner, sometimes several days in a row. Mosquitoes at night were the worst I have ever experienced. I dreaded taking my turn as Officer of the Day, which required inspecting the guard posts on the base regularly. At night we wore headnets, long sleeves and pants tucked into our socks. I kept my hands in my pockets outdoors, but when I approached a sentinel, I had to return his salute; before I could get my hands back in my pockets I had a few mosquito bites.

To get a better feel for the operation I flew a couple of night patrols as the radar operator. A few other times I hitched rides on flights to Miami to see Betty, who had stayed there and was substituting in the schools. I learned that the pilots were mostly new, not long out of training, and many were unsure of themselves. Most were afraid of the B-34, which they considered a "hot" airplane with a high stall speed, so they maintained flying speed all the way on landing until they touched down, frequently at over 100 knots.

The squadron had a number of accidents, mostly fatal, mostly caused by pilot error. One I remember was a plane that crashed in the Everglades on a training flight when the pilot decided to get down on the deck (low to the ground) and, as far as anyone could determine, simply flew too low. Before the squadron was disbanded, it became known in the Anti-Submarine Command as the "Bloody Seventeenth."

Finally we were notified that early in May we were to be transferred as a unit to Cuba. The base was being turned over to the Navy. The transfer of ownership occurred a few days

before we left. Those few days saw an almost unbelievable transformation of living conditions. Lounge chairs appeared in all the rooms and the common rooms. An officers' club materialized with a fully stocked bar and comfortable decor. The food became delicious.

An operational Navy squadron moved their planes in, and lo and behold! there was their version of the B-34, similarly equipped and flying missions similar to ours. But their pilots liked the plane. They landed them almost as though they were landing them on a carrier, and like most aircraft with tail wheels: they flared out from their final approach and stalled out in three-point landings.

It was just our luck to have to venture into the unknown when life had just become almost pleasant again.

CUBA

Cuba proved to be a revelation. We located at a relatively new base at San Antonio de los Baños, about 20 miles from Havana. Even with summer coming on the nights were cool (blankets every night) although the days became blazing hot in the sun; but the humidity was low. I never saw a bug other than a few ants, day or night. Our quarters were relatively well furnished. There was a magnificent officers' club with verandas, fully screened game rooms, an attractive bar and lounge with Cuba Libras and highballs at ten cents. The lunch menu from which one chose included filet mignon and lobster daily as well as the specials. About once a month there was a dance for which bus loads of girls from good families in Havana were brought in, many accompanied by chaperones. There was a Link trainer in a small air-conditioned building, which could serve as a refuge from the heat, if necessary.

Our operations continued as before, although the area to be patrolled was slightly different. We also acquired a few B-18's, which were an early bomber version of the Douglas DC-3 transport, which was a workhorse of the airlines and the Army. The B-18 was equipped with a Magnetic Airborne Detector (MAD), which could detect the magnetic field of a submarine which was submerged and thus invisible to radar. The search radar they carried was, I believe, the SCR-517, a 10-centimeter microwave radar, which used a B-scope displaying azimuth vs. range on a long-persistence cathode ray tube. It was much easier to read and interpret than the A-scope on the B-34's.

An outstanding characteristic of the B-18 was its buoyancy: a crew which was forced by engine failure to ditch one in the Florida Straits abandoned the plane by getting into their life raft without getting the least bit wet. A Coast Guard cutter sent to the scene picked up the men, found the plane still afloat and took it in tow. After towing it for a day and finding it slowed the ship tremendously the cutter captain received approval to sink the plane. It took a couple of hours of fire from 50-caliber machine guns, that finally severed a wing, before the old B-18 went to join Davy Jones.

Some time in August we were given additional responsibilities which I found very revealing and, to a degree, reinforcing. Another anti-submarine squadron, identical to ours, had been operating from the same air base as ours for some months. Their radar officer, Joe Masters, had been a classmate of mine, I believe, at Scott Field, but not at Boca. He had an engineering background. Their radar personnel were transferred out of Cuba, and we were given the responsibility of maintaining their planes' equipment along with our own. Petersen and I went to meet with Masters and his people in their radar shack a couple of days before they were to leave.

We found them, including almost all their technicians, in the relatively cool radar shack on a blazingly hot afternoon. Pete and I had left our men pouring sweat working inside planes that were solar ovens and hauling heavy modules back and forth between the planes and our shack in swapping out defective units. Masters and a few of his techs were huddled over a schematic trying to reason out what could be the trouble with a defective system in a plane. (Our method was to make a crude judgment from the symptoms and substitute for the module most likely to be defective, continuing to swap modules in priority order of likelihood until the system worked again. Then our best technical people, led by Mueller, would troubleshoot and repair the isolated unit in a "bench setup" of a system in the shop.) On the wall of Masters's shop was his status board. It showed all their aircraft with the radar inoperative; no plane out of their approximately 12 ready for the afternoon mission! And no one actually out in a plane trying to fix it! Masters started to explain to us what components in the circuit described in the schematic over which they were poring were most likely to be bad. I told him that all we were really interested in was the symptoms involved with each plane and how long the equipment had been down. Thus the transfer took place.

Petersen stood through the whole episode with the customary sneer fixed on his face. After we left, he made a few choice comments to me and then went to work. Within two days all aircraft in both squadrons had their radar operable.

It wasn't much longer before we were notified to terminate our radar patrols and our B-34's and B-18's were flown off elsewhere. During all my tenure in the squadron there had been only a few reports of radar detection of what could have been submarines, but no confirmed visual sightings. I don't remember that anyone ever dropped depth charges on a suspected or confirmed target. Nor had any friendly shipping been attacked in our patrol zone. German submarines had pretty well been driven from that area.

Our flight crews picked up a squadron's worth of B-25's, the Mitchell twin-engine medium bomber, which had no radar and was faster and easier to fly than the B-34. Our crews continued to fly visual patrols, carrying depth charges; they also used the aircraft to practice formation flying, which they had not done since completing flight training (all radar patrols had been single-plane missions.)

With no more radar gear our technicians had nothing to do. Rather than let their morale droop, I made the rounds of the squadron staff and lined up jobs for the men in other areas, some of them far from their usual duties. One young man didn't know how to drive. I found him a job driving a truck. He was overjoyed. Whatever their jobs, they were pretty cheerful about it all. And it didn't last too long.

Word came that the 17th, along with the whole anti-submarine command was to be disbanded. All our radar people, both technicians and operators, were transferred to Langley Field at Hampton, Virginia.

The existence and use of radar were still closely guarded secrets. All equipment and documents were classified "confidential" and had to be handled in accordance with security regulations. My job was still classified as "Special Equipment Officer," the designation which appeared on my identification card. Once I received transfer orders, I made arrangements with the appropriate base officer to move all our spares, test equipment and documents to a warehouse on the base, which he assured me would be kept locked and under guard. I made out an itemized receipt for his signature and had him sign it when I delivered the materiel.

LANGLEY FIELD

We arrived at Langley toward the end of September, 1943, to become part of the 1st Sea Search Attack Group. I found I was now one of perhaps 15 radar officers, mostly from the Anti-Submarine Command, assigned for further training. There were also a few who had been in England attached to Royal Air Force units which used radar in night fighters against German bombers, with direction from ground radar. The British had developed and used the earliest tactical radar and had more experience with the technology and utilization than anyone in the world. I immediately lost touch with the enlisted men, who were assigned to various parts of the group for training and duty working on radar equipment.

Our group of officers, who may have constituted the majority of the Army's experienced airborne radar officers, immediately set to work to study up on the next generation of airborne radar, which used microwaves, and bombing attachments. Certainly we studied the 10-centimeter equipment, the SCR-717; we may also have learned something about the 3-cm. AN/APQ-13 and AN/APS-15. Our texts were the technical manuals on the systems. We rotated as instructors, since no one had any experience with it. Our group was led by Major Hermelin, an engineer and technical writer from New York, who had previously been at some higher staff level, and he coordinated our scholarly activities.

After a month or two of study we were assigned to various squadrons of 1st Sea Search. The one I joined was training in the use of the AN/APQ-5 electronic low-altitude bombsight used in conjunction with the SCR-717B search radar. We had radar technicians who maintained the equipment, including a radio altimeter, all of which was installed in B-24 4-engine bombers. The flight crews in the squadron were being trained in low altitude blind bombing of targets at sea.

About this time I was called on the carpet by my commanding officer. He read to me a communication from the base in Cuba which stated that classified materiel and documents, which had been my responsibility, had been found in an unguarded warehouse at the Cuban air base. I was to be censured, with a copy of the censure to be placed in my permanent personnel file. The C.O. demanded an explanation. I was flabbergasted. Finally I recovered enough equanimity to describe the measures I had taken and the assurances I had received that our leftover stuff would be handled in accordance with regulations. Fortunately the C.O. believed me and told me to forget it.

A word about the 1st Sea Search Group. It was a specially designated unit, commanded by Colonel William Dolan, used for proving out the tactical feasibility of new radar equipment and developing tactical doctrines for its use, after which they trained personnel to use the equipment in the field. The two kinds of equipment they were working on then, in the fall of 1943, were our low-altitude stuff and the 3-cm. H2X to be used for high-altitude bombing of land targets. Since I took seriously the security precautions which were drummed into us and I had no "need to know" about the high-altitude equipment, I had no contact with that gear or the people working with it.

I did learn that our Low-Altitude Bombing (LAB) operation followed on an earlier one which had received the first pre-production equipment from Bell Labs, debugged it, developed appropriate protocols for its tactical use and then gone to the 13th Air Force in the Solomon Islands in the South Pacific to test it in combat against Japanese shipping. That operation was known as the "Wright Project," because it was commanded by a Colonel Wright. It was operating at that time, and I would hear vague reports from time to time that it was doing well. I would also hear about an Ed Sharkey from Western Electric, an engineer who was one of several from WE and Bell who were with Wright, and who was considered the real expert on the equipment.

First Sea Search had been operating at Langley for some time. Its personnel were considered permanent cadre and we, from elsewhere, were considered temporaries there for training. In general we reported to the permanent people; they were also presumably the most knowledgeable, having worked with factory engineers in the early stages of equipment development. Colonel Dolan was reputed to have a direct telephone line to the Secretary of the Army in Washington and to have close personal contacts with the Air Communications Office at Army HQ.

The squadron to which I was assigned started operating more or less as a unit with flight crews running practice missions bombing a fixed target, simulating a ship, a few miles offshore in the Atlantic. I had some radar technicians, and we maintained the equipment. The other ground personnel were all "permanent party" at Langley.

I reported to the squadron's permanent radar officer, Lieutenant Ronald (Ron) Atwood, who had been at Langley for some time and lived with his wife in quarters on the base. He was from Boston and had, I believe, an engineering degree. He also had what struck me as a somewhat superior attitude; I speculated that it might result from the possibility that his background could have been that of a Boston Brahmin. I lived in the bachelor officers' quarters on the base, although Betty came down a couple of times from Yorktown Heights, New York, where she had gotten a job teaching in the junior high school.

After a short time in this setup I observed that, as far as I could see, Ron Atwood didn't do anything. What he had done

before our arrival I had no idea. What I did discover was that, when I needed spare parts, test equipment or supplies and properly went to him as the proper channel, I could not believe his promises. Nothing ever happened. Eventually I decided on the following practice: I would make my request three times; then I would go around him—over his head as it were—to make my request to the appropriate party, taking my chances that this might offend him. That is what I did. We got what we needed, the enlisted men did their jobs and we kept the equipment functioning and the squadron's operations effective. He never objected.

Also in the permanent cadre was Master Sergeant Masewicz, an older regular Army man who had been associated with Colonel Dolan and radar for some time. He was knowledgeable, but domineering and a heavy drinker. Most of the enlisted men didn't like him.

The time came when we were all called together and told that we would be the next project to be shipped out of Langley. We could not be told for security reasons where we were to go. Our commander would be Major Armand Pohan, a dashing, energetic pilot with a large ego. But he was dedicated, ambitious, and determined to do a good job. Since I was the radar officer for the project, I had occasional dealings with Major Pohan.

I enjoyed my contacts with him because he was obviously a doer, but pilots I talked to in the squadron didn't think much of him because he was so obviously cocky. He had flown four-engine aircraft for only a short time, probably less than some of the pilots reporting to him, but he acted like an authority on everything. They said he was not a very good B-24 pilot; of course he only flew them from time to time, while the flight crews flew them day in, day out.

I wanted to have the experience of actually using the radar bombsight to drop bombs, so I would know what the bombardiers were called on to do. Finally I arranged to fly a training mission as bombardier. As luck would have it, Pohan decided to fly as pilot for that mission. We went out and made our quota of runs, dropping bombs on the practice target, with reasonable results. When we returned, he flew a tight pattern with a steep approach, like one would use with a smaller plane. He flared out as we approached the end of the runway, but instead of the plane's floating in and settling gradually as it stalled out, it dropped like a rock into the turf a couple hundred feet short of the runway. Fortunately the landing gear withstood the shock, but it shook up all of us.

His intense style was typified by another incident. Once when I was in his office, an outside one in a hangar, with the field-side wall right behind the chair where he sat at his desk, he interrupted our conversation to say he had to go to the men's room and for me to go with him. We walked out the office door opposite his desk and went to the men's room in another part of the hangar. He talked rapid-fire all the way there, while we stood at the urinals, and all the way back. He opened the door to his office; we were startled to find it filled with what looked like smoke. As it settled, we realized it was dust. Before us were his collapsed desk and chair with an airplane engine on them, and part of another engine, with the wing visible beyond it sticking through a large hole in the hangar wall. Apparently the brakes had grabbed on a taxiing B-24 and it had veered into the wall. He, and perhaps I, owed our survival to his bladder and his insistence on not letting a minute be wasted.

Major Pohan, at a point during the winter, called all the flight crews and radar personnel together to tell us that we would be leaving in the spring for a destination he could not reveal. The time and place were highly classified and were not to be discussed. However, a few days later he announced that a brief course in the Chinese language would be offered (I believe only for the officers).

Learning that I was to be the radar officer for the project pleased me greatly. We would be the first regular tactical unit to be deployed with this equipment; everything up to then had been experimental, and factory development engineers had been heavily involved in the maintenance and use We were to be on our own. I believed I, if anyone, could get the job done, because I was probably as experienced as anyone in the field, having been out "on the line" for a good six months. Furthermore I believed I knew how to be a good manager of the people involved. Above all, I knew from personal experience we had achieved better results than most radar-equipped units in producing the day-to-day results needed; my commander, his staff and the flight crews had come to regard their radar as a normal part of the plane, like the engines, and to take it for granted. Some other units were still treating it as some new, mysterious entity in its experimental stage, which might do great things if it it could be made to work. Consciously or unconsciously, some of the radar officers may have encouraged that view, perhaps feeling some added prestige in impressing others with their membership in a knowledgeable elite.

Someone in authority, probably Pohan, sat down with me one day to give me the specifications on what I and the radar maintenancee people would be required to do. It sounded thoroughly challenging.

1. I would have with me two other radar officers. Lt. Andy Horton, whom I had never met, and Lt. Ezra Richards, whom I had known at Boca.
2. Attached more of less temporarily would be two Signal Corps officers back from England, Lt. Dave Leich, who had been a power company engineer in New Jersey, and Lt. Bob Mattison, whose background I no longer remember. Also there would be two Western Electric field engineers with factory training—Riley, who had been with us in Cuba for a while, and Jay Peeler.
3. From the large pool of radar technicians who had been collected at Langley, for LAB training I could select some 35 (I believe) with certain restrictions on ranks.
4. We would have perhaps a third of our personnel included in the air echelon, travelling as passengers on the approximately 15 aircraft which would constitute the the initial complement of the project. With us on these planes we would have to take everything we would need to operate regular LAB missions by all aircraft for three months.
5. The remainder of the personnel and all other parts, test equipment and supplies would proceed by ship and arrive after three months.

6. Between what we took with us and what went by sea, we would have to take all we needed to operate for one year with no support or resupply. In response to my questions they determined that we could get lumber and nails on location, but not hand tools such as hammers and saws. Food and fuel would be available but not clothing.

I set about reviewing the resumes of the available technicians and drawing up lists of equipment and supplies, right down to screws and hand tools, and requisitioning them. I no longer had much to do with my erstwhile superior radar officer, so I was able to get done what I needed expeditiously. From my review of the resumes I made a selective list of technicians to interview and set about that.

Rather than have all the most technically qualified people available, I wanted a mix, including two positions that were not provided for in a normal radar maintenance organization. I had found there was a need for a good clerk to keep up with all the record-keeping; one needed to do maintenance efficiently, to monitor inventories of and order needed parts and supplies, to handle correspondence and numerous other details without which you couldn't get the job done. We were also wholly dependent on the gasoline-driven generators we used to furnish power to the radar equipment on the ground when we were testing it. Gasoline engines take considerable maintenance themselves, and these were used heavily. When power units fail, the whole maintenance operation shuts down. Although aircraft and motor pool mechanics were usually willing to work on them, it was always their lowest priority. We always had plenty of our own people who liked to tinker with them, but most were not very good at it, it was a poor use of a technically proficient radar man, and they gave preventive maintenance on the "putt-putts," as we called the generators, short shrift. I wanted a dedicated putt-putt man.

I also wanted a substantial number of diligent, reliable men who, because they were not very strong on the theoretical aspects of electronics, were uncomfortable trying to solve difficult trouble-shooting problems. They were happier doing the tough work of isolating a trouble in a plane's equipment to a major module by substituting units known to be good and hauling good and defective units back and forth to the radar shack. They should also work well with other people. I also needed a few supervisory people.

Petersen was gone, having been released from the Army either at the end of the Cuba tour or shortly after reaching Langley because he was needed to keep his farm going; it was the sole support of his wife and children. Wally Mueller would be one of my strong technical people. Stan Atterberry was among the most experienced available as well as one of the highest ranking and, although I had not known him before, he impressed me as a strong, quiet, well-respected non-com. Though he was not a college graduate, he had worked for a phone company in Illinois as a technician and seemed very knowledgeable. I appointed him informally as the head non-com and consulted with him on equipment lists, personnel selection and other matters. He knew the men better than I.

For a clerk I picked Reginald (Reggie) Lawrence, a 45-year old bachelor who had not quite reached the age of no longer being subject to the draft. He was a playwright, a Princeton graduate, and had been teaching playwriting at a New York college. He told me right off that radar and electronics were mysteries to him even though he had been through all the schools. He did not appear to be trying to avoid being sent overseas and seemed decent and diligent enough. He was very pleased to assume a clerical role.

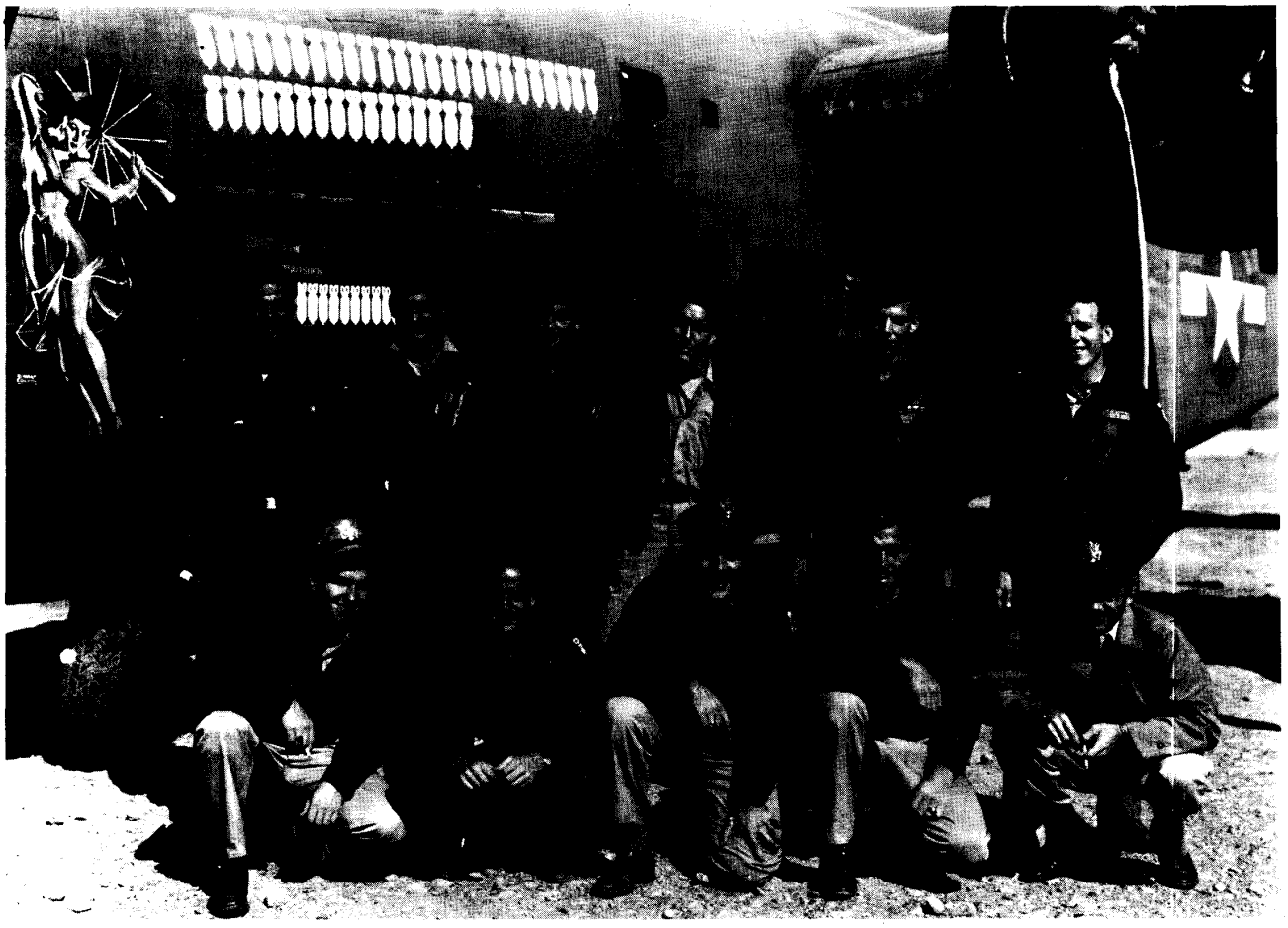
Then I found a man who did not think much of his abilities in working on electronic equipment, but was willing enough to do it. He had been a farmer, was accustomed to working regularly on his tractors and doing chores on a rigidly regular schedule. My experience up to then with men who had come from farm backgrounds was that they were very reliable about doing chores that should be done regularly. That is an important part of preventive maintenance. He welcomed the chance to work on gas engines rather than electronic equipment, so he was to be the putt-putt man. I did not consult with anyone about using people who were designated in one specialty to work exclusively in another. I decided it was necessary and did it.

Things went well. The complement of men was completed, and they seemed to look forward to the new assignment, while doing their jobs of keeping the training missions going at Langley. The equipment and supplies were stockpiled and separated out into what would go by air and what by sea. We made the same divisions of the men, insuring that an appropriate mix of the key people would go by air so that we could start operating immediately on arrival. We had had our Chinese classes, which did very little good. Ultimately word came that we were to leave at the beginning of May, which was only a couple of weeks off. Then came an announcement which really shook up several people.

The word came that the legendary Colonel Dolan would himself lead the LAB project overseas, with Major Pohan reporting to him. Complete consternation on the parts of Ron Atwood and Master Sergeant Masewicz, the two top permanent cadre associated with our project. To them their futures depended on their association with Dolan. Where previously they had poorly concealed their chortling at the dire fate awaiting all of us destined for overseas, now they became desperate. For reasons I still do not know they believed that being left at Langley, with all their comforts as permanent personnel, would be worse than going with the project. Maybe they thought that without Dolan they would be subject to shipment elsewhere overseas under even worse circumstances.

They immediately set about trying to get Dolan to take them too; and they succeeded. After about a week we learned that they had indeed been added to our roster. They were overjoyed. Their faith in the doctrine of "whom you know" had been justified. But not for long.

About a week before our departure still another bombshell was dropped. Colonel Dolan would not go with us after all. (I learned much later that he had been offered what he considered a better assignment in England. He left for England after my departure from Langley, so it was only in 1991 that I learned his plane had crashed crossing the Atlantic with no



Bill Cashmore and Crew with B-24 "Monsoon Maiden," the Crew and their Plane with whom author flew to China. Cashmore is squatting at right

survivors.) Imagine the reaction of Atwood and Masewicz. Here they were, having accepted the horrible fate of going overseas as a tradeoff against having to face life without their patron; now they were facing both prospects. They ran feverishly to everyone they thought could help them at Group HQ. It was to no avail. Colonel Dolan was apparently preoccupied with other matters, and apparently no one else took an interest in their plight. They ended up going to China.

Dolan's place was taken by a Lieutenant-Colonel Hopson, from the group staff, of whom I had never heard. In the few days before we were to take off I do not remember any contacts with Hopson, except that he informed me that he and I would each travel in one of the two planes scheduled to leave on the first day of the move, because he wanted the two of us to be the first to arrive.

Since the war Bill Hopson and I have kept in touch. He and his wife Laura have become our good friends. While I was writing this, he gave me a copy of a log he had kept daily from the time we left Langley through the duration of our project. I have quoted from it where the terse reports, seldom more than a few words or a sentence, add to the story.

Departure was at hand. Each of us going by air was given a weight limit on what personal effects we could carry on the plane. A foot locker and a duffle bag could go by ship. The last two days before departure we loaded all the planes with our equipment and supplies within the weight limits we had been allotted. The plane thus would carry full flight crews, a couple of extra people, heavy loads of gas for long flights and our initial shipment of radar equipment and supplies. I was told that our B-24's would be the heaviest B-24's ever to have taken off. That was at the official weights. Faced with the prospect of an indefinite stay overseas many of the people clandestinely loaded extra items they thought would be useful. I even heard without confirmation that one crew had disassembled a jeep and loaded the parts on their plane.

GOING TO CHINA

Takeoff was on a sunny morning shortly after the first of May. I believe two of us passengers were assigned to each plane. Mine was painted on the nose with the name "Monsoon Maiden" and a suitably voluptuous young lady; it was number

0276. The pilot was Bill Cashmore, a somewhat saturnine man with little to say, who was somewhat older than most of the flight officers. The copilot was Dick Jensen, the navigator Joe Herbst, and the bombardier Jack Samson. (I talked to Jensen and Samson in 1990 and found I had flown with a crew with bright futures: Jensen had ended up as CEO of Jockey, the underwear manufacturer; Samson became editor of *Field and Stream*. When last heard of Cashmore had been a chicken farmer in California.)

Our first stop was Morrison Field, at West Palm Beach, Florida. That was the jumping-off point for many flights from the East Coast to Africa and beyond. We received a thorough briefing. It included instructions to take advantage of the opportunities provided at every stop for exercise; it was important for proper rest and alertness. They also told us that the cumulus clouds we would encounter over South America would be unlike those we were accustomed to. They would produce little turbulence and we did not have to worry about flying through them.

The next day we were on our way. Our stops on the roundabout way to China were set up about eight hours apart for our B-24, a long day's flight between landings. My seat was on the floor of the flight deck behind the copilot, with very little more floor space than what I could fit into with my knees pulled up. No seat belt. I could kneel or stand if I wanted to. The only advantage was that it gave me a good picture of what it takes to fly a four-engine aircraft. To pass the time, particularly over water where there was no terrain to look at, I read Mark Van Doren's new book, *Liberal Education*. (I enjoyed it so much I sent him a letter from China commenting on it.) We normally flew at about 8,000 feet, to maximize speed and still not use oxygen. Over land it was too high to see details on the ground; over water it made no difference.

The stops: Trinidad, off the northeast coast of South America; Belem, Brazil, on the northern part of the coast; Natal, Brazil, the most easterly airfield in South America; Ascension Island, an isolated island in the middle of the South Atlantic; Accra, Ghana (then Ivory Coast), along the Atlantic coast of Africa; Kano, Nigeria (then French Equatorial Africa); Khartoum, Sudan (then Anglo-Egyptian Sudan), where the temperature was 108 F per Hopson's log; Aden, Peoples Democratic Republic of Yemen (then either an independent city or a British colony); Karachi, Pakistan (then part of India); Calcutta, India; Chabua, India, in the Assam Valley; and finally, Kunming, China.

At each stop I tried to follow our briefer's advice, swimming at every opportunity, especially since I spent most of my flight time in a cramped position. Most places provided arrangements. The chief items of interest I remember were: being driven to a swimming hole in Trinidad right out of a Tarzan movie, in a jungle stream to which we descended down a steep bank hanging on to vines; waiting to take off at the end of the runway at Belem and watching the plane ahead of us, an American C-46, I believe, crash and burn just out of sight beyond the trees, sending up a thick cloud of black smoke; (not a reassuring incident) delicious Brazilian coffee in Belem and Natal so strong it felt like it was etching the enamel on your teeth; taking off from Natal in the dark before dawn with an extra-heavy load of gas, thinking of having to find Ascension Island, a tiny spot in the middle of the ocean with no other land within hundreds of miles. Bill Cashmore really sweated for the first hour because with the heavy load and the heat of the air he could not gain any altitude for a good hour, so we flew at about 100 feet off the water until we had used up enough fuel. Fortunately Ascension had a good radio beacon, so we found it with no trouble. Then there was swimming off the rocky coast of Ascension, being very careful of the current and rocks, in accordance with local warnings; buying a pair of ebony bookends, samples of local primitive sculpture, at a shop on the base at Kano. I was very impressed with the quality of the many sculptures on display. We still use those bookends.

And I recall being amazed at the aplomb of Bill Hopson, when we stayed a couple of days in Karachi waiting for orders. Until then I had spent my time at stops with our flight crew. He however invited me to tour Karachi with him. He apparently made inquiries about what was to be seen, then ordered a jeep from the base and drove around Karachi with me. The next day he told me we were going to the beach. Using the jeep again he found the way to an isolated beach on the Arabian Sea, where there were no habitations but a few fishing shacks. Pulled up on the beach were several small, single-masted sailboats, each crewed by an elderly man and a boy. Hopson selected one and we went out for a sail for a couple of hours in the sea and a back bay. His curiosity about the local area and people, and his attitude of authority in dealing with military people to whom he was unknown showed me a whole new way of operating.

We crossed the Hump from Chabua to Kunming with an Air Corps pilot who was based in China and had experience flying that route. Hopson flew as copilot. We had been instructed to keep our eyes open for enemy aircraft; along the way a ground station asked if we had any "company." But we saw none, the weather was good, and we made the trip uneventfully at 14,000 feet, where we had to use oxygen. For me that consisted of sucking on an oxygen hose, since I had no mask. Finally we reached China. It had been a roundabout trip by way of the southern hemisphere, much longer than a Great Circle route, but we had made it safely.

CHINA

China was a backwater of World War II. The press concentrated on the war theaters of Europe and the South Pacific, although there was occasional mention of efforts to keep the Burma Road open as the only ground route for supplies into China to keep Chinese pressure on the Japanese. Earlier, even before Pearl Harbor, there had been an occasional feature story about the derring-do of the "Flying Tigers" of the AVG, the American Volunteer Group. They were a controversial group of volunteer pilots and ground crews who had been recruited by General Claire Chennault, a dissident officer of the Air Corps who had retired after a frustrating career. They flew Curtiss P-40's, a pretty much obsolete Air Corps fighter type.

In Chabua I started keeping a diary. I kept it up sporadically for a short time, but eventually I gave it up. Some of what

Author's Room in Kunming. Chair was custom-made by Craftsmen in Suichwan in a few hours.

follows is taken from that and is enclosed in quotes. I have added explanatory comments in brackets. I have also included in quotes some of the laconic entries from Hopson's log.

We arrived in Chabua the morning of May 9 and took off the same afternoon for China. The 308th Bombardment Group (H) (for "heavy"), which I learned we were to join, had a rear echelon stationed at Chabua in the Assam Valley of northeastern India, near Ledo. Ledo was the western terminus of a road under construction, which was to be the new lifeline to China. There fuel and facilities were more available for training flights and aircraft maintenance than they were in China. The group flew frequently between Chabua and Kunming, our ultimate destination in China, a distance of some 550 miles to the east across Burma. The route was across the notorious, hazardous Hump of the Himilayas.

Kunming is in southwest China in the foothills of the Himalayas at an elevation of 6,000 feet. It lies about 450 miles south of Chungking (Chongqing), during the war the seat of Chiang Kai Shek's national government since the occupation of most of China to the east by the Japanese. The Fourteenth Air Force was headquartered at Kunming.

Our quarters were in one story adobe brick "hostels" with shingle roofs. Ours was for the Group staff. It consisted of some twenty rooms, half on each side of a long hallway, most of which accommodated two people. The top brass had private rooms. All were furnished with wooden single beds with rope netting for springs and straw mattresses. Mosquito netting was standard, and we were warned of the danger of malaria. (Partway through our stay we were supplied aerosol cans of DDT, with which we were to spray our rooms each night. That was the first I had ever heard of either DDT or aerosol.) We also had a dresser apiece and a straight-backed chair, along with any additional luxuries we could scrounge or buy. At one end of the hall was the entrance, which opened into a large common room with comfortable chairs and a couple of tables. At the other end was a washroom with a continuous galvanized sink with several faucets along one side and a shower which consisted of an enclosure with a drain in the floor and a shower head. The water source was a large wooden bucket above the shower head. A Chinese "coolie" usually wearing only a pair of shorts would fill the bucket periodically or on demand from two pails of water which he had carried from some source on a yoke over his shoulder. He had to climb a small step stool to empty them. Since the water was almost certainly contaminated at all times, we used water from our canteens for brushing our teeth. Some yards from our building was an outhouse, a two- or three-holer, as I remember.

"May 10—Got up at 0815, missed breakfast, walked a bit. Met Col. Hopson, Col. Fisher, Group staff and squadron C.O.'s at 1000. Col. Hopson described our equipment and its tactical use, answered questions. Looked at maps, decided to limit maintenance to Kweilin and Chenkung, divide crews evenly among squadrons. Met Maj. Powell, whom Maj. Crockett had told me about in Chabua; talked of old times and 17th . . . people. At 1400 drove to Chenkung with Col. Fisher and Col. Hopson. Selected good site and design for building and half a barrack on a hill for temporary set up. Maj. Lindsay, the Base C.O., thought we could have the building (of brick) completed by June 1. Col. Fisher promised a weapons carrier and a half-ton trailer. Everyone very cooperative. Returned to Kunming about 1800. Col. Fisher gave us some information about the Chinese and their customs en route. . . . Was informed at morning's meeting that I would be Group Radar Officer."

Colonel Fisher was William Fisher, group commander, and Major Powell was my old C.O. from Boca Chica and Cuba, now a squadron commander in the 308th. Kweilin, almost 500 miles to the east of Kunming was the location of a forward detachment of the 308th in southeast China much closer to Japanese-held target areas, and the coast, and the base from which all sea sweeps were being conducted. Kweilin (Guilin) is now one of the most popular tourist destinations in China, and the terminus of cruises on the picturesque Li River. Chenkung was the site of a large air base about 15 miles from Kunming, where two of our squadrons were based, the 374th and 375th.

At some point in the talks with Colonel Fisher he said one of our radar officers should be on the group staff and asked who was senior. Atwood had been my superior at Langley, and I was horrified at the thought he might become that again by being on the group staff. I was then a first lieutenant, having been promoted in Cuba, I believe. So was he. Somehow they discovered that Atwood had been promoted one month after me. So I was the one selected for the group job, an appropriate choice because from the beginning I was the responsible person.

The trip to Chengkung provided my first real view of China from the ground. We were in a rural, relatively primitive part of the country. The area sat on a 6,000-foot plateau and was relatively flat, although to the south and west you could see rugged mountains. The trip was over a principal highway, a dirt

road that was two lanes wide in those places that were not a single lane. We drove through and passed a few villages among the rice paddies. All buildings were of adobe brick, surrounded in most cases only by bare earth. There was never a sign of trash or litter; that was probably the result of some combination of neatness and poverty. There was an occasional, dilapidated bus or truck plodding along the road. And, pervading everything, there was the atmosphere that became for me a fundamental part of my mental vision of China, with sometimes one predominating sometimes the other: the dual odors of the alcohol engine ac exhausts and of the "honey pots" and their contents which had been carefully spread on the cropland.

Whenever we passed people along the road, many of them burdened with heavy loads or field tools, they greeted us in a manner I soon discovered was standard toward American soldiers. There was a big smile, a thumbs-up gesture, and a call of "ding hao," which meant approximately "very good."

"May 11—Started out early, got a desk in A-3 [Group Operations] office behind Col. Hopson, submitted division of personnel to Col. Hopson for orders to be written. Richards [Lt. Ezra Richards] to Kweilin with section as set up at Langley plus Haws [enlisted]; Atwood to Chenkung with the remainder. Atterberry to Group as inspector [there was no provision for such a position, but it was obvious our maintenance people would be scattered at several locations, and it would be a poor use of my time to travel around checking on them.] Riley with Richards, Peeler with Atwood. Read over Operators Reports of sea sweeps. [These had been conducted by a few of the B-24's already there which were equipped with the old SCR-521 search radars such as we had used in Boca Chica and Cuba.] Indications of ground radar interference. [Presumably, the Japanese were able to observe our flights with radar on the ground.] Went to Chenkung in afternoon, taking Lawrence and Poydock on truck. Got them started unloading ship. [This was the plane on which Hopson and I had arrived. To date only a couple of our aircraft had reached China.] Got them started unloading ship. Talked with Major Edney, C.O. of 375th; heard about his two-week walk back after bailing out. Got my baggage. Will be able to wear a clean uniform at last."

Col. Fisher included in our discussions specific orders that I was not to fly any combat missions. The previous radar officer, I was told, who had been responsible for the SCR-521, I believe, had been shot down over Hong Kong harbor. Col. Fisher thought he might have survived and been subjected to torture, leading to the danger of revealing classified information about U.S. radar.

"May 12—Rose early, dressed in aforesaid clean uniform, and went to see Major Lindsay after breakfast. [I apparently found a place to sleep overnight at Chenkung.] Maj. Lindsay was ill, so I went to Major Parmelee, the Post Engineer and gave him my lumber requirements. $2900 gold ['gold' meant U.S. dollars, so my lumber was worth a couple of thousand times that in Chinese dollars], 'the price of a new Cadillac sedan,' as he put it, is the figure for 800 square feet of 1" board and 800′ of 2 × 4. All the nails we want at five cents per nail. Arranged for a desk and chairs. Saw Major Edney about a telephone and left instructions with the enlisted men. Returned to Kunming in a command car, towing Col. Hopson's baggage and mine in a trailer. Col. Hopson told me of his talk with Gen. Chennault and the decision first to strike harbor shipping, then to maintain daily coverage with two ships [planes] of a 300 mile area across the ship lanes. They want to run two ships into a harbor as soon as possible."

"I am to share Room 18 in the Group Barrack with Col. Hopson. Col. H. showed me what he had written to acquaint crews with the equipment. Extremely complete, concise and well-written. In the afternoon I arranged for a jeep for me, probably a weapons carrier for Chenkung, a safe and a file cabinet for Chenkung. Capt. Turner in S-4 [Squadron Supply] was very cooperative. Saw Lt. Col. Wood, 14th Air Force Signal Officer, and found out that AACS [the organization that handled communications and navigation facilities in general use for all air elements] has a YH beacon [a radar beacon at the frequency of the SCR-521, not usable for our microwave equipment]. Read some reports of April's group missions, outlined reports and records for sections [the different radar maintenance locations] and group." By May 15 our commanders were anxious to run the first mission to see how well we could bomb ships in harbors. They had asked me how practical it would be. I told them it would depend on the particular geography: the area of open water to provide a background for individual ships, surrounding elevations, etc. Bombing ships in harbors had never been discussed during my training; it was always assumed we would bomb ships in the open sea.

By May 15 three of our planes had arrived, so we had four or five radar techs there. Two of them were down with dysentery, one of them in the hospital. None of the radar on the planes worked properly after the long trip. I pitched in and worked on the equipment, although I was far from expert. We tried to get one system to work by taking units out of the others to replace defective modules. We had to work with no test equipment and no work setup where we could test individual units. The diary contains details of trouble symptoms and the remedies we tried.

"May 17—[Partway through the morning I apparently left off working on the gear.] . . . Saw Post Engineer and Major Lindsay, expedited lumber, procured 6 tables (two of them minus one leg) and four chairs. Col. Hopson came over for lunch in the PT-17 [a two-place, open-cockpit primary training plane, about as simple and slow a plane as the Air Corps had. I was amazed to see one in China.] Rode back with him. Climbed to 8,500 feet [as high as the plane would go, with the Kunming area at an elevation of over 6,000 feet] and did two snap rolls and a loop—my first. The first roll scared me stiff [Hopson had not told me what he was going to do and I closed my eyes, but managed to keep them open for the rest—although I hung on to the sides of the cockpit. [To do the loop we dove steeply to near the ground to gain speed, then pulled up. At the top of the loop, upside down and hanging from my

seat belt, I heard the engine step. No sound but a gentle rush of wind at our slow airspeed. I was sure it was the end of us. But after the nose came down and we picked up airspeed, the engine started up again and we pulled level at low altitude. I learned later that the PT-17 has a gravity-feed carburetor and always shuts down when inverted.] Got cleaned up in Kunming. Col. Hopson and Col. Fisher will tell the General we won't fly the mission and I'll get set up. When a ship is in perfect shape, I'll notify the Col. and then a mission will be scheduled . . . "

Over the next several days our other planes trickled in, bringing more expert maintenance people, our two Signal Corps officers and Atwood. The latter was suffering from diarrhea. They also brought power units, test equipment, spare parts and supplies, which we packed into the makeshift shop in the barracks at Chenkung.

"May 18—Chenkung. Col. Hopson and I looked at maps and reliefs of several harbors. Samah Bay, Hainan Island, which they wanted to attack was a poor target—the Inner Harbor, at least. I discouraged him from working it first trip. Hong Kong looked good and there are plenty of others . . . "

Hainan Island is a large island off the southern coast of China. On its north coast there is a major harbor where there was frequently heavy shipping traffic.

At this point the diary tells of equipment mistakenly shipped to Yangkai, another of the Group's bases, and having to be reloaded aboard one of our planes and flown back to Chenkung; finding that some of the radar bombsights had a design bug for which there was a field fix which had not been carried out; sorting out resistors. " . . . Wilson checked all putt-putts [ground power units] without instructions. Good boy. Taylor did a good job on 717 bench set-up . . . Got all tubes sorted."

By May 19 I began to get a feel for the hazards other then enemy action which we would confront. " . . . A rumor that Sneed landed in southern Burma and is in Calcutta for repairs. 375th lost five men and a ship in a crash landing on the Hump near Ledo; 5 got out. The men in whose room I'm staying were shot down on a sea sweep after attacking two freighters."

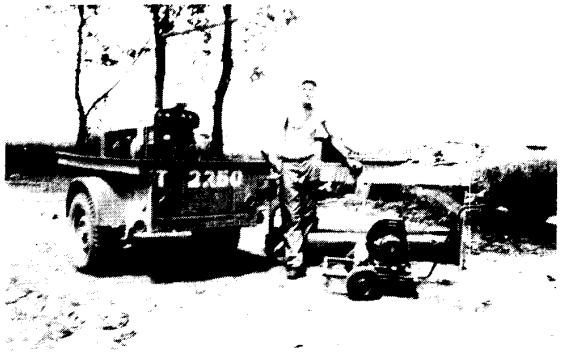
"May 21—Kunming. Met Maj. Burnett, the new Group S-3 [Operations Officer]. Got LAB ships assigned and word out to squadrons. Brought over 972 and 276 for test flight and preparation for mission. [These were the first two aircraft the men at Chenkung had been able to make ready, trying to work with spares and test equipment dribbling in.] Too many clouds for test; postponed till tomorrow morning. Col. Fisher, Hopson and I decided to set up beacon [designed for our radar frequency] in an anti-paratroop mud pillbox at south (?) end of runway. . . . Obtained a bunch of maps to start working on RCM [Radar CounterMeasures]. Col. Fisher decided to shift first mission to Hong Kong, probably with 2 planes. I am to have a desk in S-3 . . .

"Sent Atterberry to Chenkung to get their records started and to help put the ships in commission. . . . Prepared target data on Hong Kong and read it to Col. Hopson. He approved, and we went on with quite a discussion of the operation of Q-5 [AN/APQ-5, the electronic bombsight]. Listened to an animated discussion of the ministry, the Medical profession and the army by Col. Fisher, Maj. Gjerde, surgeon, and Chaplain Mengel. They all fretted about the economic aspects and were grateful to the army for relief from money worries." [The depression still loomed large for most of us.]

"May 23—Kunming. Went through Johnson's [Johnson must have been previous radar officer who was shot down] RCM [Radar CounterMeasures] file at 14th AF. He has a lot of material—but it's not organized to do anyone any good. Maybe I can get Lawrence [the playwright/clerk] to do some work on it. . . . Big meeting of all group officers down to flight leaders. Col. Hopson outlined potentialities of equipment and plans, and answered questions . . . Planned mission for tomorrow night."

"May 24—Kunming. Peeler [one of Western Electric field engineers] blew in, in uniform. Mission changed to Samah Bay where there is supposed to be a convoy, while there is nothing at Hong Kong. Sampson [Cashmore's bombardier] is at hospital under observation for asthma, so it's Wallace's crew and Uthe's. Poor Bill Cashmore! Uthe ran 972 off into the mud taxiing here and they had to bring 862 over. Atwood not back [he had been in hospital for possible appendicitis], but seven ships are in commission. Ordered six 35 mm. cameras. [These would be used for taking radar scope photos.] Sweating out the mission. Col. Hopson and Col. Fisher are with Uthe; Major Gough, C.O. of 425th with Wallace."

"May 25–Col. Fisher's outfit couldn't see a thing on the inner harbor. Coastline and terrain were so mountainous, the picture was broken into the appearance of islands. [The ten-degree beam of the ten-centimeter radar did not give sufficient resolution.] Searchlights and intense A/A on last of four runs. [Hopson's log for that day: 'Flew mission to Samah Bay. Caught hell from ack ack.'] 717 went out on that run. Still don't know cause. Wallace and Maj. Gough made 5 runs on ships and bombs wouldn't even go when toggled and salvoed. Settled transportation with Powell and Edney [the two squadron commanders at Chenkung]. Joiner [one of our non-com radar techs] is doing a hell of a good job and the shop is operating. Crowded with equipment and no benches. Told Mattison he's in charge and put Stillman on building benches and shelves.



Sgt. Taylor with his Putt-Putts

"May 26–Everyone jubilant. Fife got a ship and Schulzkumpf got one. So the General says to throw everything at them. Fife missed a second ship, but Col. Averill, who was along, was happy as a lark. Fife bombed from 1000′. Schulz from 2000′. Both got quite a concussion and Fife's rate was three seconds off when it was checked. Tonight was first real aborted mission. Uthe brought 972 back (Fife flew it last night) with scopes jumping. Peeler fixed it in ten minutes, but it was too late for take-off. Three ships got off."

But all was not roses. "May 29–Kunming. Schulzkumpf is missing from a mission on the 27th . . . "

The diary is full of details of individual missions and operations. At some point in the next month or so Col. Fisher told me he was adding me to his tactical staff, which consisted of the key officers involved in operations: Hopson, who had been named Deputy Group Commander, and the Operations, Intelligence, Engineering and Armament Officers. We met daily first thing in the morning, heard a briefing of events in the Group, 14th Air Force and the world in the last 24 hours, then determined plans for operations in the future. My role had become much greater than it had been in the Anti-submarine Command, where it had been concentrated on maintenance. Now I had full responsibility for the radar maintenance; but probably half my time was spent on tactical matters as I was consulted daily on the feasibility of operations. My superiors had learned the potential of radar not only for low-altitude bombing of shipping at sea—the design mission—but also for navigation, intelligence, weather detection and possibly high-altitude bombing of land targets. They kept looking for ways to stretch its capabilities.

Having decided I should know more about navigation, I procured an "E-6B Computer," a combination circular and linear slide rule and drawing instrument. I boned up on dead reckoning. (I already knew from Communications School a certain amount about radio aids.) Now I knew what it meant to "fly a landfall," and included flying radar landfalls in planning routes to target areas and other bases.

As we started reporting shipping sunk at a much greater rate than the Fourteenth had ever before achieved. Hopson and Fisher asked me how we could be as certain as possible of the claims we made of results. These claims were based on what the flight crews reported. Sometimes, looking out the windows of the plane they could see the flash of the bombs exploding and possibly what type of ship they were attacking. Intelligence officers at the interrogation of the crews did their best to assess what had actually happened, trying to correlate what the crew members reported with what they were able to determine from other intelligence reports of ship movements, etc. I set about formulating standards and criteria for assessment of results.

To do this I met with the officers of the small Navy detachment which served as liaison with Fourteenth HQ. Our crews were already instructed in the various types of Japanese merchant and war vessels, as they were in the types of enemy aircraft. The Air Corps and Navy already classified positive results of attacks as "sunk," "probably sunk" or "damaged." Now how could we tell after attacking a previously invisible target what that target was and what happened to it? We discovered fairly soon that isolated rocks in the sea gave radar reflections similar to substantial ships. So did the sails on sampans.

Suppose the flash showed that a 500-pound bomb had hit a ship directly. Is it sunk, probably sunk or damaged? The bombs we used had delay fuses, 2-second delay, I believe. This was to give them time to penetrate to the interior of a vessel before they exploded. The Navy people were willing to estimate the result for a hit by such a bomb on various types of ships. They also estimated that a near miss by one of those bombs would at least cause damage to any ship. Based on our collective, conservative opinions we arrived at the following set of standards:

1. If a target disappeared from the screen after an attack, and the radar was still working properly as indicated by the presence of other targets still showing, sea scatter (the broad indications at the shortest range on the radar scope, resulting from radar reflections from the water and waves), etc, it was sunk.
2. If the target suffered a hit or a near miss and was identified visually as of a type which would be sunk if it sustained a direct hit or a near miss, whichever was appropriate, but the plane had to leave the area after a few minutes without seeing it disappear from the screen, it was probably sunk.
3. If the target after visual identification was one which the Navy could not be sure would be sunk by one or more such bombs—such as warships—and it did not disappear from the screen, it was counted as damaged.

We did not communicate these standards to the flight crews. We simply had the interrogating officers, radar and intelligence people, ask the crews the pertinent questions about the nature of the target, where the bombs landed, how they could tell those answers, how long they stayed in the area, what other targets they saw on radar, how long the targets remained on the screen, etc. The intelligence officer then drew the appropriate conclusions.

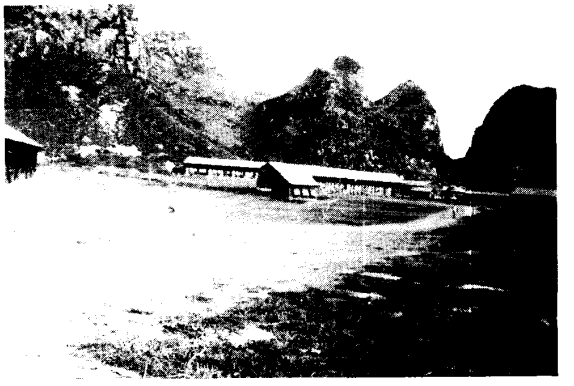
By now Hopson and several crews had flown a number of missions. Hopson's words: "29. Flew mission to Hong Kong and into Kweilin. Fighter followed me in. 2 ships attacked . . . 31. Flew mission from Kweilin to China Sea and on to Kunming. Two ships attacked." After flying a number of missions and reviewing what was done by various crews Col. Hopson developed a protocol for crews to follow for attacks, reviewed it with the tactical staff and had it issued as a standing order by Col. Fisher. It prescribed certain practices:

1. If the autopilot was working, all bomb runs were to be made on autopilot. Many pilots were incensed. They believed they could fly manually better than any autopilot, and at low altitude they considered relying on the autopilot dangerous and foolhardy. Hopson responded by saying that a properly working autopilot could do a better job of holding the plane straight and level than he or any

Quarters and Scenery at Liuchow Airfield, 1944

other pilot could, and it was necessary to achieve maximum accuracy.

2. Searches would be conducted at whatever altitude was appropriate to get maximum range from the radar. Once a target at sea was determined, the pilot was to descend and make his first run at an altitude of 400 feet. He could use his own judgment about altitude, up to 2000 feet, on subsequent runs. If he had identified the target as a war vessel, the 400-foot requirement did not apply.
3. Our weather information was so meager we had no reliable knowledge of the barometric pressure in the target area for setting the barometric altimeter. So to insure safety when descending so low it would be necessary to calibrate the barometric altimeter from the radio altimeter for local conditions; but was the radio altimeter reliable enough to trust the crews' lives completely to it? Therefore we established the following procedure: Pilots were to descend to 2,000 feet as shown on the radio altimeter. That was its upper limit and still high enough to be pretty certain of not hitting the water. They were then to set the barometric altimeter to the same 2,000 feet, by changing the pressure setting.
4. While descending to bombing altitude of 400 feet they were to let out the trailing-wire radio antenna, which was a few hundred feet long. The reel for that antenna was in the interior of the waist of the plane, and the gunner who let it out was to keep a hand on it. The weight on the end of the antenna was sure to hit the water before the plane if it descended too low because the radio altimeter had provided a wrong reading. Although I never heard of a plane having its antenna hit, going that low at night so far from home



was still a risky procedure. Nevertheless many crews made all their runs at 400 feet; some went as low as 100.

This was a very demanding—and hazardous—requirement, but this was the collective judgment of the responsible commanders. Everything else about the operation was risky, even above the normal risks of wartime bombing operations: Airplane maintenance was carried on under primitive conditions at the end of supply lines, with everything having to be flown in over the Himalayas; weather was very changeable, with sparse data on which to base forecasts; terrain was daunting with mountains west of Kunming going up to 15,000 feet and the Kunming area itself sitting on a 6,000-foot high plateau; communications were minimal; and the threat of Japanese bombing always remained. So these additional risks seemed worthwhile in order to have the best chance of achieving the best results.

At the beginning of June, I was at the base at Liuchow, southeast of Kweilin and a little under 450 miles east of Kunming. It was to be the staging base for the "big mission," not identified in the diary, but which was to be a surprise attack on Manila Harbor, which had been out of range of such attacks since the islands fell. I took several technicians to Liuchow to preflight the six planes which would go. Gen. Chennault—and

no doubt Washington—felt the psychological impact would be worth the difficulty of the task. Manila was only conceivably in range from Liuchow if weather conditions were excellent and the most rigid fuel conservation was practiced en route. They believed the radar would make possible the necessary navigational accuracy to bring the mission to the target at night as directly as possible and permit the pilots to get lined up for a visual bomb run just at break of day. The chances of success seemed very low, as the following entry indicates:

"June 2–At briefing only Maj. Edney and Bill Cashmore looked as though they had the faintest intention of going to the target. Maj. Burnett gave a routine picture of the flight without inspiration, without good reasons for undertaking so perilous a mission. Bacalis sank a wheel off the side of the taxi strip taxiing out, Swett came right back with radio trouble, the rest returned because of extremely bad weather on the route . . . "

At the same time Col. Hopson flew a sweep up the Yangtze to determine the effectiveness of LAB and radar for bombing shipping on a river at night. Not so good. " . . . mission found radar almost useless, drew heavy fire from gunboats every time they made runs on large freighters on the river, probably got four barges and a tugboat."

A couple days later at Kweilin I visited our advance radar maintenance detachment led by Ezra Richards. Their chief problems were transportation and moisture: " . . . monsoons are making this place resemble Brazil."

Personnel kept trickling in. The advance detachment at Kweilin made nightly sea sweeps with fair success. Radar had become a key element of the group's operations. The non-radar planes and crews continued their activities flying daylight formation raids on logistics targets in China and Burma, mostly to help try to stop the renewed advance of the enemy. I had noted on May 29 that the Japanese " . . . have started their push from Hankow [now part of Wuhan] to Canton . . ." We had decided to set up facilities for radar maintenance at all three squadron locations, as well as at the advanced base, and that had been carried out.

Atterberry was doing a fine job in his quiet but authoritative way of seeing to it that all the maintenance operations got set up properly and had what they needed. He alerted me to problems and kept me well informed. Lawrence made sure all the paperwork went smoothly, plus more. I noted that he had produced a report on the electronic countermeasures situation, based on the 14th Air Force files, which I found "excellent."

Major (now Lt. Col.) Pohan finally arrived with a flourish and took command of the advance detachment at Kweilin. The flight crews did not like him very well. Presumably he drove them very hard. They still did not think well of him as a B-24 pilot. My recollection was that he led a small flight of planes to make a radar attack on river shipping, was shot down and never returned. He had been in China only a few weeks.

Until June 11, five days after we had celebrated the announcement of D-Day, I had considered myself lucky because I had been spared the GI's (diarrhea, short for "gastrointestinal"), which we had been warned would afflict any new arrival in China. But then I too was laid low for a good week with chills and fever. I had first felt the debilitating symptoms as we were taking the radar beacon at Kunming to the hill where we were going to install it. I wasn't much help in getting it up the hill, and the men were very solicitous of me. Our group surgeon had me taking large quantities—maybe twenty at a time—of big, fluffy sulfa pills, even one of which was difficult to get down. Perhaps a month later I was hit again, this time even worse. I can remember being on the verge of collapse and supported on the shoulders of Colonels Hopson and Fisher to the latter's staff car so he could drive me to the hospital. Diagnosis: "dysentery, acute—cause unknown." It was a miserable experience.

Hill in Background (top cut off in photo) on Top of Which we Hauled the Radar Beacon at Liuchow

By June 23 I was estimating our crews were scoring direct hits on 48% of their attacks. On June 29 Hopson notes he went to Liuchow to make arrangements for the move there from Kweilin. By the middle of July we had moved because of the immediate Japanese threat to Kweilin. Sea sweeps were called off so our planes could all be used to ferry gasoline and armament to the fighters and medium bombers so they could try to stop the Japanese advance on the ground. There seemed to be a slight chance that tactical air power, along with the Chinese ground forces could halt the enemy.

On July 17 I was at Liuchow. Our forward echelon had been experiencing an increase in aborted missions, and Col. Hopson was very dissatisfied. He told me maintenance had to improve. From my visit I concluded a number of things.

The radar beacon at Liuchow was next to useless because it had been set up beside the tower near the runway, and its line of sight to the east—toward our target areas—was cut off by the high hills bordering that side of the field. The location was convenient because there was already electrical power available there. I had the men set it up instead on a steep hill behind

the barracks area. They placed a gasoline-driven generator at the base of the hill and ran a power cable up to the beacon. It was an exhausting, all-day job in hot, humid Liuchow to get that beacon and its wiring up that hill.

Also, the men were demoralized, and Richards looked tired and strained. From my observation and talks with Richards I concluded that most of the trouble was that Ezra did not trust the men, nagged them and tried to do all the work himself. These technicians were among the best we had brought and proud of their abilities. Now they felt insecure and resentful.

" . . . Tried to explain to Richards that he would have to take less personal part in the work, but—as Riley [one of the Western Electric tech reps] says—he's bull-headed and insists that that is the only way to get things done right." I concluded that the couple of weeks of hiatus in sea sweeps would give them time to get organized, and hitched a ride back to Kunming with Hopson.

Tactics were still evolving. Hopson on the 26th: "Went to Liuchow to try mast-head bombing at night, bombing approach on instruments. 27. Flew the Mission at 400 feet. Sank 3 ships and damaged one in 4 attacks. Japs hit field while I was gone. 28. Killian sank 3 ships with the same tactics."

Back at Kunming I found another problem. During my absence, Col. Gough, the C.O. of the 425th, had promoted all his radar mechanics without consulting anyone. These were people at a rear base with very little radar activity; they had not qualified for the most part to be in the elite group sweating and being bombed at Liuchow. The Communications Officer there thought only one deserved promotion. " . . . It caused consternation from here [Kunming] to Liuchow especially since good old Atwood had failed to turn in any recommendations at all. Col. Gough was shown his error at a squadron commanders' meeting."

In the early part of August I was concerned about my not having been promoted. My position on the organization chart had always called for a major; most of my opposite numbers held that rank at Group HQ, while I was still a first lieutenant.

"August 7–Kunming. . . . Operations have been running out of Luichow [as spelled in my diary; the atlas spells it with the "i" before the "u"] for the last two weeks. Col. Hopson started things off with three confirmed and a probable and Major Killem [the detachment commander] followed up with three confirmed . . . Richards has had several failures out there and is still bitching. So far he has given no reasonable explanation of the failures. . . 14 of Col. Smith's 24 planes [a force to supplement the original project] have arrived bringing all but the kitchen sink [parts, supplies and equipment] . . . Only 10 of the original ships are left, but no more casualties. The water shipment is in dead storage in Chabua [India]—all but the putt-putts which are being distributed.

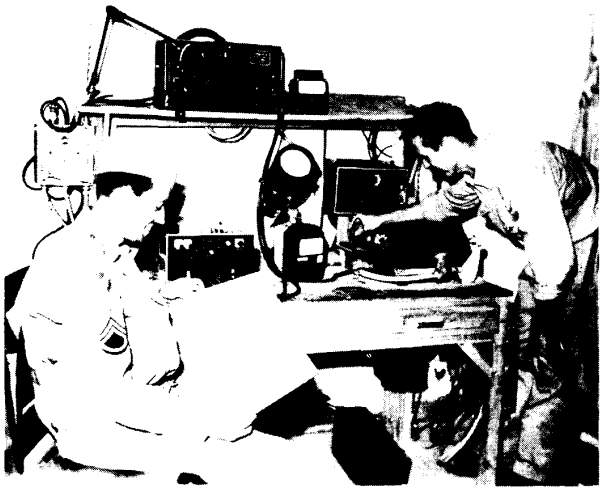
"August 21–Luichow. Arrived here on the 13th with Col. Fisher, Col. Smith and eight planes that were to stage for the old Manila deal. At the last minute the mission was cancelled by higher headquarters. Fisher and Hopson put me on the spot

Transmitter and Receiver Tanks of SCR-717B. Technician is Pressurizing Transmitter

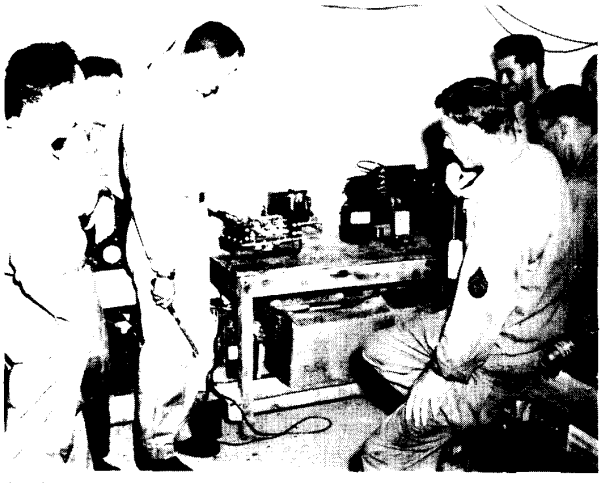
to cut down the failures (maintenance had been running about 75%). Richards was short of men and putt-putts and had the mechanics thoroughly disorganized and demoralized. He was in no position to preflight the eight planes and it was obvious there would be failures. The ships all went out on a sweep and three failed, but thank goodness Fisher's and Smith's didn't. I sent back for . . . [eight men, including Masewicz who had trapped himself at Langley into coming to China much against his will] and two putt-putts. Six men and the putt-putts arrived, but Masewicz and Taylor bailed out of the tanker they were on when one engine quit and they started to stall out. [They had not been ordered to abandon the plane and were the only ones to do so. They walked back to the Kunming area unharmed.] . . . Horton [the Signal Corps lieutenant detached to us from Warner-Robins, Georgia] also came out and I sent Richards back to rest, take care of the Group job and mostly to get him out of the way so I could work without interference."

It was not only the radar which had maintenance problems. Engines and other equipment gave trouble as well with the ground work being done at the end of such a long and tenuous supply line. But crews flew their missions nonetheless. An example is in Hopson's entry for July 5: "Laid mines in Shanghai Harbor. Three generators and the bombing circuits went out before arriving there. Went in on instruments at 400 feet and bombardier stood on catwalk and tripped out mines manually."

Liuchow was very hot [in Hopson's words 'hot as hell'] and humid at that time of year. Our water had to be boiled and was still hot or warm when we drank it. In the radar shack we had a Lister bag hanging (a canvas bag the outside of which was kept wet by the water supply in it) which was refilled daily. It was supposed to cool the contents by the evaporation of the water on the outside surface, but the humidity of the atmosphere made that scheme relatively ineffective. We carried canteens with us at all times. If I took a drink, I would burst into a sweat, so that it seemed as though I lost all the water immediately. Hopson's entry for July 13 is "absolutely enervated by heat. Hot water did nothing." Our buildings were all of mud brick with tile roofs. The sun heated them like solar ovens during



Techs Working on Bench Setup of AN/APQ-5 Radar Bombsight



the day; at night they radiated the heat back. We would lie in pools of sweat on our beds trying, with little success, to get some sleep. Any sleep might be interrupted by an air raid alert, which would send us out in helmets and carrying gas masks to crouch in slit trenches for an hour or more. That environment led to late-night poker and Black Jack games (which proved somewhat profitable for me).

In this climate our maintenance men had been working during the day in planes parked in full sun, which became even hotter ovens then the buildings because they had far less ventilation. It put them in no mood to be blamed for aborted missions.

Richards had turned over the responsibility of briefing and interrogating crews to Riley, a civilian, while he, as an officer, was trying to do the technical maintenance. Things were in poor shape.

My assessment a few days after Richards' departure led me to drastic changes in the way we operated. I talked with Pete Needham, the non-com nominally in charge. He was depressed but was able to put his finger on a number of problems and make some good suggestions. Riley was also helpful. I identified two of the men whose morale was lowest; two 45-year-old bachelor draftees, who had come out only recently. Their griping seemed to influence some of the younger men. I called them in and told them that I felt they were too tired to do a good job and I was sending them back to Chenkung. They pleaded with me to let them stay. One of them was literally in tears. They promised to do a good job. I relented.

What I did do was set up a night shift, so that essentially, all the work in the planes would be done at night when the ships cooled off quickly. In order to do that, though, we had to deal with the possibility of air raids, which took place at night, particularly when the moon was out. The planes were parked in dispersed revetments, where the men could not see out and where the noise of putt-putts and alternators prevented them from hearing much from outside. I procured a transmitter which would transmit at a frequency available on the planes' radio receivers and set it up in the radar shack. The protocol we established was that as soon as there was an air raid alert, one person in the shop would broadcast that fact on an assigned frequency while another started out in a jeep to the aircraft on which men were working. All technicians working in planes would keep earphones on at all times, listening to that frequency. As soon as one heard the warning, he was to shut down all power, leave the plane and wait by its side until picked up. If a man finished work on one plane and moved on to another, he was to notify the shack by radio. That procedure seemed thoroughly acceptable to the men.

Further to refocus the effort I took over the briefings and interrogations, leaving Riley to act as a consultant in what he knew best, keeping the equipment running. I put Horton in charge of the night shift and shortly assigned him to the night interrogations. Needham took on full responsibility for assigning and supervising the men during the day; he and I agreed to give Milt Recker that responsibility at night.

I had also concluded that raising the morale of the maintenance men would be key to improving the performance of the operation. Their low morale contrasted with the exhiliration of flight crews and staff officers. I realized that, while the flyers and others were "in the know" about the outstanding results the detachment was achieving, the maintenance men knew nothing about the outcomes of missions. Those outcomes were "Confidential"; presumably the technicians had no "need to know."

However, I reasoned, all our maintenance personnel had security clearances for "Confidential." It seemed important that they have some idea of what their hard and dangerous work was producing. So I set up a blackboard in the shop, near the status board on which they kept track of the condition of each plane's radar. Whichever officer or (later) non-com did the radar interrogations when the crews returned from missions was to fill in the chart for each plane that had flown: how well the gear had worked, and the results of the mission as vessels sunk, probably sunk or damaged, mines dropped or land targets bombed. They thus became part of the team. They were no longer low-level employees simply doing the job they were paid to do. They knew how their efforts contributed directly to these important and highly successful missions. It, along

Radar Maintenance Section at Liuchow, Fall, 1944; Author is Standing at Left

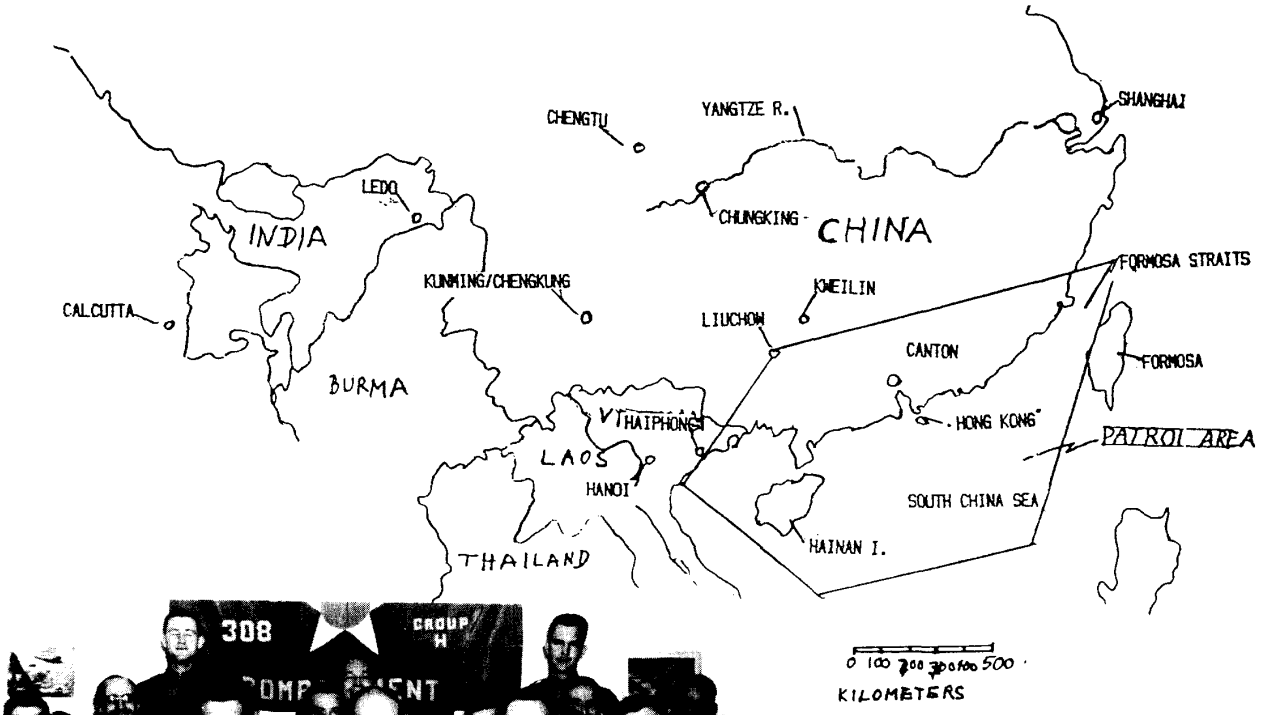
with the schedule changes, produced a great improvement in morale.

The degree of that improvement was brought home to me by an incident which at the time I found almost unbelievable. When I first arrived, I found the men going to work in the morning sullenly, with the sun beating down and sweat pouring and not evaporating. A few days after the changes went into effect I was amazed to see as I walked from the mess hall to the shop after breakfast most of the night shift, stripped to the waist, out on an empty area near the shop playing a loud and boisterous game of softball in spite of the blazing sun and the miserable humidity. That was after a full night of work under the constant threat of Japanese bombs.

At about this point we had settled into something of a routine, a very demanding one. Tactics, target areas, navigation and communication procedures, maintenance practices, etc. had been established. The task now was to do the maximum amount of damage to the enemy. We flew two or three sorties per night. Planes took off late in the afternoon, flew routes to the coast that avoided the population centers, all held by the enemy, so that they crossed the coast after dark. They carried enough gas to spend two or three hours searching the target area, following preassigned patterns in the Formosa Straits and the South China Sea, staying west of a line that had been agreed upon with the Navy. No submarines were to intrude beyond that line at night, so our planes were free to bomb any targets that appeared. If a plane found no ships, it went on to one of the coastal harbors—Kowloon and Hong Kong, Amoy, etc.—dropping its bombs from six or eight thousand feet manually by radar. From maps and scope photographs we had identified the most productive targets as they would appear on radar and briefed radar operators, navigators and bombardiers on what to expect. It was not "precision" bombing like LAB. (Map on Next Page)

Our detachment at the Liuchow forward base consisted of some seven ground officers and probably less than 100 enlisted ground crew plus our two Western Electric tech reps. Added to them there were the four or five flight crews who had been rotated in for a couple of weeks each. It was, looking back, an isolated existence. We were totally absorbed in the tasks at hand, so we did not miss the lack of information about the rest of the world or even of the war elsewhere in China. Mail was rare and welcome when it arrived in batches of a dozen or two letters at a time. There were fortunate occasions when crews who had experienced the conditions at Liuchow were good enough to bring beer, which they had carried in unheated parts of their aircraft at altitude, so it was cool if we drank it right away.

We ground personnel did not suffer too much from boredom and time on our hands except when the weather was bad enough to prevent flying missions. There were heavy work loads, nighttime tasks, bombing raids that kept us in slit trenches for extended periods. Sack time during the day was usually welcome. Occasionally a movie would be shown outdoors after dark; even B films were a pleasant diversion. Air raid alerts and



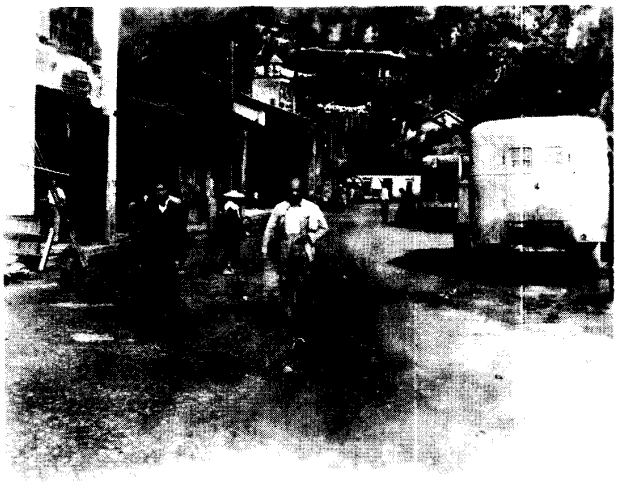
308th Bomb Group Staff after November 1944 Centered in front row from left: LTC Hightower Smith, Operations Officer; Col. John G. Armstrong C.O.; LTC William D. Hopson, Deputy C.O.; Author is second from right on last seated row

air raids might interrupt, but things would start back up after the all-clear. When we had a movie, Chinese people from the area would come to watch, standing on the perimeter of the audience. I was struck by the number of men who carried young children. Machismo was apparently not part of their culture."

During the first part of August, Hopson notes in his log that he received a commendation from General Arnold and, a few days later, notification that he had been awarded the Distinguished Flying Cross. General Arnold was "Hap" Arnold, Chief of Staff of the Army Air Forces during World War II.

From the diary entry for August 21, the first one in a couple of weeks: " . . . Have a night shift going now, all the planes in and the three for missions and alert preflighted by noon. No rush, the men feel better and will, I hope, do a better job. On our present basis of two ships sweeping nightly and one on alert the men get finished early and take off. We should have no trouble handling a heavy rush job from time to time . . . I've taken over the briefings and interrogations from Riley and am trying to lift the load off him wholly. Horton has been on nights, including interrogations. I've been on days, and we'll swap around. He still has a lot to learn about the equipment. LeVan and Shytle sank a cruiser in three runs with direct hits each time. I understand it's to be publicized. [It was finally publicized in some detail by Jack Samson, the bombardier with whom I had flown to China, as a feature article in the April, 1990, issue of *Air Force Magazine*.] They sure deserve it. If we can get a ship a night and raise radar successes to around ninety [percent], I'll have done my job and will go back to Kunming happy. HAB will be difficult until we get the new method of setting release line to bottom of ground return all figured out and modify all sets correctly. [This must have been a scheme devised for setting altitudes over 2000 feet into the

Bench Setups of SCR-717B at Liuchow, Fall, 1944



Street of Liuchow, Fall, 1944
Showing Barbed-Wire Barricade and Gun Bunker for Defense Against Approaching Japanese

"August 22–Luichow. Three ships last night attacked a bunch of naval vessels near Hong Kong that seemed to be out waiting. The first two got nowhere due to heavy fire and plain failure to hit anything. Col Smith took the alert ship out and scored two direct hits but nothing sank. No missions tonight due to weather. Col. Fisher and Gen. Vincent pulled in today for some unknown purpose, but I didn't see them. Taking this LAB equipment and having it compute the correct release point. We never made much use of it even if we might have succeeded in incorporating it.] Col. Smith is now in command of the detachment . . . [Lt. Col. William Hightower Smith, a tough, dark-complected, cigar-chewing officer who shared my room for the remainder of the time at Luichow.]

Train Loaded with Refugees Waiting to Leave Liuchow, October, 1944. White items in foreground are toilet paper. Train was still there when we evacuated base in early November

Closeup of Loaded Train, Liuchow, October, 1944
Note bare foot in lower right corner (arrows) where refugee has found a spot for travel. Train did not move for days and was still there when base was evacuated.

Lin River through Liuchow, with Floating Bridge, 1944

Technician is Pressurizing Transmitter

opportunity to change night shifts, giving Horton a chance at day work and putting Pugh in charge during the day time under Recker."

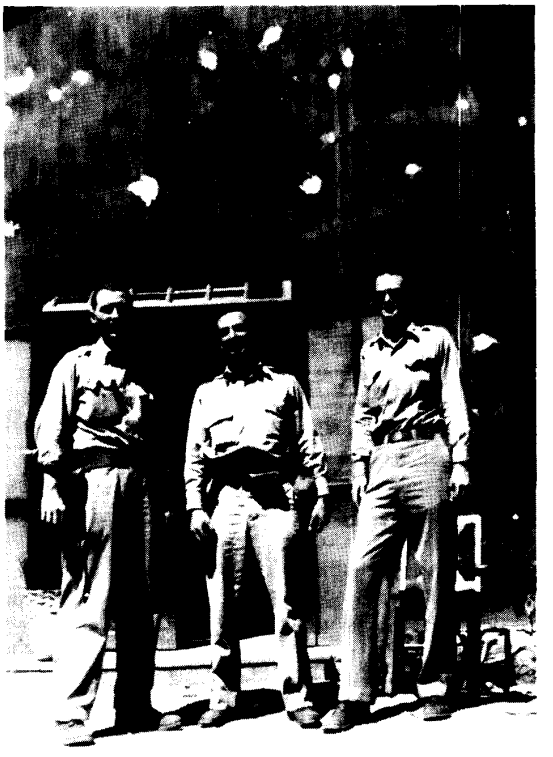
"Sept. 5–Kunming. Maintenance looks as though it's licked. For the last third of August, out of 20 sweeps only one was aborted and two were partially aborted, dropping bombs and damaging the enemy. Instead, it's crews who were missing targets. Now the pressure's on and the best crews are going out east and so am I again. I'm disappointed: no promotion, no officers I can count on or that Col. Smith or Col. Hodson is willing to count on. [The reason for the pressure was that we had been informed the Japanese were pulling back from Southeast Asia and the Philippines. This meant there would be heavy traffic proceeding north and east through our target area. Furthermore there would be some enemy warships both convoying merchant vessels and retreating as naval units. We understood some warships were equipped with anti-aircraft radar, but normally our planes found they could make the first run without the enemy apparently having been warned.]

"September 16–Luichow. All of the 68th Composite Wing, [a fighter wing] has pulled in here plus the Z-forces [a special task force of the Chinese Army set up with minimum equipment to defend eastern China] with a B.-G. and B.-G. Vincent. Rumors had been rife . . . Kweilin was surrounded . . . Yesterday, Vincent ordered us to move without saying where. Tore down the shop in record time and loaded the airplanes, then received notice that we'd run two sorties. Later word came that Chennault said for us to stay. Sank five ships last night, the planes are still loaded and we're awaiting a decision from Vincent on whether we go or stay. Can't operate long with no shop. Col. Smith is eager to stay, Russell [Detachment Operations Officer] and Jo Hardgrave, the Engineering Officer, and Ed Stumpel, the adjutant, are crying to go. I'd just as soon stay for as long as we can operate successfully. This morning Col. Smith says the Japs are 60 miles from Kweilin and that one field at Kweilin is still open. Horton is sick in the hospital and will go back to Kunming. With both Peeler

Results of Japanese Bombing Raids, Fall, 1944, at Liuchow Airfield. Wreckage of B-24, Hit and Burned in Revetment; exploding railroad car, probably loaded with fuel

[the other Western Electric tech rep] and Riley here things won't be too tough. About three Jap planes came over last night, dropped a flare and bombs. Nicked a couple planes on the ground."

It had now become apparent that we had reached the climax of our operations. The sea was full of Japanese ships. In four months we had developed tactics and skills that made our searches and attacks highly effective. But it was obvious the enemy was determined to get us out of Liuchow; they had the resources to do it. Major commitments of Chinese troops with Fourteenth air support could slow, but not stop them. Our success in this operation greatly exceeded any expectations—



Author Flanked by Western Electric Tech Reps Bill "One-Ball" Riley (l) and Jap Peeler (r). They stand at door of radar "shack." White patches on wall are scars from Japanese anti-personnel fragmentation bombs

from Washington, Fourteenth HQ or frankly from us. If only we could hang on in Liuchow.

It was during this period that I made one of my few visits to the city of Liuchow, where I found barbed-wire barricades set up in the streets, ready for its defense. I took a few snapshots of the streets, the market area and the Liu River, with the pontoon bridge spanning it. A substantial area of the city consisted of ramshackle assemblages of huts, little more than roofed cubicles big enough to lie down in, and full of girls in shabby clothes. The explanation I was given was that Liuchow was a trading center for prostitutes, many of them very young, who were brought there and bought and sold, as in a slave market.

When I returned to China in 1986 and visited Liuchow, Chi, the guide who took me there from Kweilin, proved to be a native of Liuchow whose family still lived there. He told me his mother had recounted how she fled Liuchow along with thousands of others before its capture. We used to see the refugee railroad cars standing for days near our airfield, with every inch of space in them, on top of them and under them jammed with people. One of my photos shows a loaded car with a foot protruding from under it, where someone had apparently found a way of suspending himself underneath the bottom of the car. The fields around were a vast latrine dotted with pieces of toilet paper.

Cars were still sitting there when our forces left. I have always suspected a giant scam with tickets for the cars sold at exorbitant prices even though the cars would never move.

In '86 I was able to take pictures of the same places from the same spots as in '44, including some of the base, now a Chinese Air Force Base with our revetments, runway and taxiways still there, although one revetment I saw encloses a basketball court now. The pontoon bridge is gone, replaced by a large, modern suspension bridge downstream. The stone steps at the river's edge where I photographed women washing clothes in the muddy river are still there, but now are part of a delightful park that covers the shore and the bluff above it.

On the way to Liuchow I showed Chi, who was about 30, some of the old pictures so that he could take me to the same places. He looked at those of the bridge, with sampans and small, single-stacked power boats tied up to it, and the river, which served only as laundry but as a site for disposal of all the sewage from the many boats on which families lived, and became pensive. "You know," he said, "I have always had a vague picture in my mind of falling into the river from a low bridge, almost drowning and being pulled out. I never knew if it really happened or if it was just a dream. But there really was a bridge!"

The Liuchow area contrasted with Yunnan Province around Kunming. It was flat, except for picturesque conical hills which sat in groups protruding from the plain, surrounded by rice paddies. The paddies were irrigated by paddle wheels driven by bicycle-like arrangements which peasants pedalled hour after hour.

"September 21–Luichow. Chennault sent orders for us to stay. Unloaded and had benches set up in 12 hours. The evacuation system had worked like a charm. Plagued by failures—eight out of 25 sorties since the eleventh, three out of four in one night. But the next night Cashmore sank four and Batchelor got two and a probable. [Sinking four ships set a record for one sortie and represented 100% success on four bombing runs. The protocol we had settled on early in our activities was to carry 12 500-pound bombs and to drop three bombs, spaced 50 feet apart, per run. The intervalometer was set so that the center bomb should hit the target, with the others straddling it. Of course, if the run proved to have been made along the length of the ship (the crew had no way of knowing from the radar indication the direction in which the ship was pointed), two or possibly three bombs might score direct hits. However, a small azimuth error would mean all three bombs would miss if the ship proved to be parallel to the bomb run, or a higher probability of one hitting if the ship turned out to be at right angles. A range error would produce the opposite results. The hope was that the ship would be turned at 45° or less to the plane's path.] 30 ships sunk, 4 probables and a damaged in 20 days of September. 788 and 782 that caused six failures between them had mismated plumbing joints in the spinners [a reference to the rigid coaxial tubing that carried the energy from the transmitter to the rotating parabolic antenna, or "spinner"]. Caught up on shop units now and things should go better. Six Japs came over a couple nights ago and dropped—among other things—a couple bushels of anti-personnel bombs. Modified our crew set-up so Recker takes interrogations and the night crew does bench work. Riley and Peeler both work days and so do I. It seems to be an improvement . . . We were notified that so far this month the detachment has sunk a fourth of all the shipping sunk by the 14th in two years."

Lounge in Officer Quarters, Kunming, China
Col. Armstrong seated at left front. Animated speaker is Major Jones C. Laughlin, Flight Surgeon; Author is sitting behind Laughlin's extended arm.

"September 28–Liuchow. Still here. Haven't sunk much for several nights. On 9/25 Bill Cashmore was followed for 20 minutes by 2-engine fighter in spite of evasive action. He dropped 12 bombs on one run, sank a large ship and damaged a smaller one in a closely packed convoy. Last night Col. Smith with LeVan's crew and Kuhse for operator was jumped by up to 12 two-engine fighters over a convoy but no shots were fired. Followed him over an hour. Dropped 9 bombs on second run and sank a 19,000 ton whaler. [I remember being shocked by Hightower's appearance when he returned from that mission. His usual tough bravado was gone and his face was as ashen as his dark complexion would allow. He told me that going back across the Formosa Straits, trailed by enemy fighters for over an hour, was the scariest thing that had ever happened to him.] Col. Smith is in tough shape today, trying to figure out countermeasures. After 3 nights respite about six Japs dropped bombs setting on fire a locomotive and a couple of cars loaded with gas. Quite a sight! Situation maps show Japs 95 miles from here and bypassing all towns in between. Peeler and Riley thought it the better part of valor to leave two days ago. Col. Smith had a message typed up directing him to keep all technical personnel here to the last and had Riley in a do-or-die condition. [Riley was the butt of constant jokes because of his concern for his personal safety. He was, after all, a civilian. The Chinese air raid warning system displayed alerts at our bases by running one, two or three large red paper balls up a flagpole, with one meaning Japanese planes had taken off and could be headed toward our base, two confirming that the planes were indeed heading for us, and three meaning attack was imminent; Riley usually headed for the air raid shelter on a one-ball alert. That led to his being known as "One-Ball Riley," a play on the title of a popular bawdy song of those days.] . . .

Major Horace "Stump" Carswell with one of the Crews he flew with as Detachment C.O., Fall, 1944 He won the Congressional Medal of Honor posthumously for his last flight. Carswell is standing, second from left

"October 4—Falling way behind on our one a night. After losing two airplanes on the ground [probably as the result of a Japanese bombing raid], last night Destiche "landed" 667 according to the Chinese 120 miles east of here—reason unknown. The night before, Bonning is presumed to have bailed out of 833 on the way to Kunming after missing Luichow. Last night we received word of a radioed commendation from Gen. Arnold. That makes Fisher, Chennault and Arnold [who had commended our operation]. Wing Commander Blackburn of an RAF [Royal Air Force] B-24 squadron is observing; General Fitzgerald, of Stratemeyer's [Gen. Stratemeyer was commanding general of Far East Air Forces, and technically Chennault's superior] Evaluation Board, went along on a mission. Getting to be celebrities; and the damn Japs (75 air miles away) will probably chase us out just when we're getting hot. Letters from Cooper and Burrus. All the boys at Langley made Captain. Cooper is a group officer as are Antl, Van Horn. Hartman is wing officer in Italy. [These were all classmates from Boca Raton.]"

"October 8—Liuchow. No flying for two days due to weather and gas shortage. Everyone is already fed up with idleness. Commendation from Arnold on mission of Sept. 19 for 6 sunk and a probable. Extravagant praise. Blackburn left, having told Col. Smith of his 1,300 hours of combat time, being torpedoed in the Mediterranean and escaping from a prison camp. Made Captain as of 1st. So did Ron Atwood. Japs haven't moved much."

"Oct. 12—Liuchow. Still no flying. Weather cold. Japs have started moving in south. . . . Morale is high, but everyone is impatient for missions to start again. . . . Finished a curriculum for course to be given to all tactical staffs. Going to send it to Peeler for him to give while I'm out here. Also wrote out orientation material for new crews. If this idleness continues, I'll have to take up creative writing."

Now comes a period with no entries in the diary. The next entry indicates it was a very tense time as well as a busy one. We were down to the absolute minimum number of people with which we could carry on operations, with no rest or relief. We started every day wondering whether the next takeoffs would be for missions or evacuation. However, morale was high. There was a kind of exhilaration in living dangerously; we heard only second hand where the enemy was. The next entry tells the story of the final days at Liuchow.

"November 7—Kunming. Returned from Liuchow yesterday. Much had happened. Col. Fisher was replaced by Col. Armstrong. . . . Maj. Carswell took the detachment, sank a cruiser and a destroyer one night with Armstrong's crew and sank a destroyer and is missing with Rinker's crew. All in less than a month. Armstrong sank another destroyer and got lots of publicity. Crawford of the 375th then took over and handled the evacuation. Marshall did a lot of crazy things on daylight missions including the bombing of a transport in an escorted convoy. Wind [a pilot's name] hit two freighters and a destroyer and had his plane shot up. Bullet bounced off a bomb in the bomb bay and another dented the radar operator's seat. Had a gas line and a hydraulic line severed and washed out the airplane on landing when only one brake held. Otis had an elevator shot off and a bullet in the 729 when he sank a destroyer. [The 729 was the IFF (Identification Friend or Foe) device, a transponder to identify the plane to ground or airborne radars as friendly.]"

Major Carswell, who sank the destroyer, was Horace "Stump" Carswell, who had only recently arrived in China from Langley Field, and was eager to get into the fight. As I went to the briefing for his mission with Rinker's crew, his radar operator came over and said to me quietly, "Lieutenant, I'm scared to death to go on this one. This guy wants to be a hero."

I went to the interrogation when several of the crew members walked back after bailing out. They told the story of encountering heavy anti-aircraft fire during their bomb runs on an escorted convoy. Generally, when attacking defended targets, most bombers turn off their bomb runs to evade anti-aircraft fire right after they release their bombs. That was the practice of our crews, too. Unfortunately at our low altitudes in heavy B-24's the turn did not take effect until the plane had passed almost directly over the target. The enemy knew that. Therefore in trying to shoot down our planes at night enemy war vessels put up a "cone of fire" directly overhead rather than attempt to aim, knowing that the attacker would have to fly through it.

Carswell's plane had been heavily damaged, two engines were out, one gas tank was punctured and the hydraulic system crippled. As they headed for home, they threw out everything they could spare to lighten the load and were able to reach land. They knew they could not make it home, and they started to prepare to bail out. One parachute was badly shot up and could not be used. One crew member was wounded seriously and was unconscious. They reported the situation to Carswell. He took off his chute and gave it to the man without one and said

he would stay with the plane. He gave the order to bail out, and they did. One uninjured crew member carried the wounded man and pulled his ripcord before letting him go and pulling his own. The wounded man did not survive, nor did Carswell when he crashed.

Carswell was awarded the Congressional Medal of Honor posthumously, and Carswell Air Force Base in Texas is named for him.

Wind's copilot was Elmer "Hainan Harry" Haines. He has written a book based on his diary which was published in December, 1992. In it he describes that mission graphically. (The manuscript is listed in the References.) It sets out the story of the conditions routinely braved by the flight crews.

Harry Marshall did some strange things, with unfortunate consequences. A New Yorker, Harrison Marshall, was a tall, solid man who had been a football lineman at New York University when NYU was a football power. He was an excellent pilot, dearly loved and respected by his crew. When we had abandoned Liuchow and were limited to relatively low-priority missions, Harry finished making his daylight bomb runs (using Azon—for "azimuth only"—guided bombs which we received at about that time) on a railroad bridge bristling with anti-aircraft batteries; then he set out for home. On the way he saw a moving train, descended and determined that it was loaded with Japanese soldiers. He told the crew he would go down and strafe the train, and the nose and belly gunners got ready. They descended to minimum altitude and made three strafing passes along the length of the train in their big, lumbering four-engine bomber. Troops leapt off the train in panic. According to an account in an issue of the *Jing Bao Journal*, the newsletter of the 14th Air Force Association, "On the third run, the Major turned to his co-pilot and said: "Hey, Tom, I can see those little bastards shooting at us."

Those were his last words. With them Harry slumped in his seat. A single bullet had hit the plane, and it had passed through his head.

I remember going to Harry's funeral. Chaplain Albert, the Catholic priest who conducted the graveside service, was himself a tough man, very appropriate for that task. He had taught me to play bridge, was a tough competitor on the tennis court (I am sure I heard him mutter some expletives most unsuited to a man of the cloth), rode around on a motorcycle, and was decorated for repeatedly going back into a burning plane to pull the occupants out even though the fire was exploding the ammunition on the plane. It was a moving occasion for me, standing on a hill on a cool Kunming day. Not many people attended: Transportation was not that available. I could visualize Harry, the big, determined guy, full of confidence, a true leader; his crew had always been ready to follow him in the most daring of initiatives. And suddenly no more Harry. Some desperate soldier had, almost blindly, done him in.

" . . . The evacuation was screwed up. We were scheduled to leave twelve hours before the fighters. The 25's left 5 days before us. We were to continue maximum operations to the end. The weather socked in—but solid. Our ships [B-24's from the Kunming area] and the transports couldn't get in to help. We loaded all our equipment but the putt-putts and flew all the men out (24 to a plane) on eight ships . . . Maj. Crawford trying to get off with the eighth airplane had a runaway prop, finally unloaded all extra men and all cargo and got off on the third try. The Japs were supposed to be less than 20 miles away, the field was to be blown on the 7th and the fighters were weathered in. Looked pretty desperate but the weather broke yesterday afternoon and the transports got in and out . . . "

The day before we abandoned Liuchow I had the men take all the spares and equipment we could not fit on the planes and which we could most easily do without, smash it with hammers and throw it into the river which ran near our base. The morning we were to leave, all buildings were blown up.

Some things stick in my mind from the two days of the evacuation. One was seeing two men in naval officers' uniforms in our barracks area early the morning of the 6th. I asked them who they were. They said they were indeed naval officers and were trying to get a ride to Kunming; having been harbor watchers at enemy-held Amoy. When I pressed them for more details, they told me they had lived, in spite of the fact that Amoy was occupied by the Japanese, in rented quarters on the waterfront and watched ship movements in the harbor, reporting them by radio to their Navy contacts in the fleet. They always dressed in their uniforms so they could not be considered spies.

The other concerned Harry Marshall. His crew was designated to take the first plane out of the base, and I was to be a passenger with him. Our technicians loaded all radar equipment and test gear we had not destroyed onto the bombers for transportation to our western bases. Late on the night before departure day Marshall barged into my room to say, "You know what your guys did? I was just out to check the plane over. They lashed all that radar gear to the control cables! Get them to repack it." I promptly did that. His thoroughness probably saved the lives of all of us.

Our accomplishments after the loss of Liuchow were minimal. China had always been a low-priority theater, supported mostly in the hopes of tying up Japanese military resources while the Navy and Marines advanced toward the enemy homeland. China also served as a base for a while for B-29 raids against the Japanese islands but the Chinese bases were far more difficult to supply than were the Pacific island bases such as Saipan and Tinian. Our effort received real support only for those couple of months in the fall of '44 when we had a major impact on Japan's raw material and food supply lines from Southeast Asia. During those months the entire effort of the 14th Air Force and of the 10th Air Force B-24's based in India was focussed on supplying Liuchow with gas and bombs and delaying the Japanese advance on the ground. Most of the non-LAB B-24's were fitted with bomb bay gas tanks and served as tankers.

By the end of February, 1945 just about all the original LAB crews had been rotated back to the states. I divided my time between Chengtu and Kunming. Hopson stayed in Kunming, serving as anti-shipping coordinator for the 14th Air Force. All the radar-equipped 24's were consolidated in one oversized squadron, the 373rd, based at Luliang, north of Kunming.

There were occasional, not very productive missions to the area around Hainan Island. We now had 3-centimeter radar, designed for high altitude bombing of land targets; planes equipped with it led the mass raids against Germany, making possible successful bombing even when targets were obscured by clouds or darkness. For our use the LAB was tied into it. But attacks against harbor installations and rail yards in China were not of much interest to the strategists compared to bombing Japan itself with B-29's. Nor was Azon bombing of bridges accorded much attention. We marked time.

Colonel Armstrong was ambitious. His chief ambition at the time was to become a brigadier general by commanding a wing. He tried to justify building up the 308th to a wing. In that effort he brought additional staff officers into China, many of them with considerable rank. After I had been a captain long enough for a promotion, I explored with Hopson and Armstrong my being promoted to major, the rank my job had called for since I arrived in China. It turned out that, with the additional staff officers, we were now over strength in majors. No promotion.

Finally in April, or May, Hopson went to Manila to discuss with the top brass of the theater what was to be done with the fifteen or eighteen planes and their crews which constituted our LAB force. He returned and told me they would be transferred to the 7th Air Force and stationed on Okinawa, which had recently been taken and more or less secured. The 7th was anxious to have the LAB people and planes an asset, they believed, which would be of great value. The rest of the group would be transferred to India to wait for shipment back to the U.S., but no one knew how long that would be. Hopson would be in command; he gave me my choice: I could either go with the group to India and wait it out, or I could go as a radar officer at squadron level with the 373rd to Okinawa. I asked him if I could make major if I went to India with him. He told me he doubted it, because they would still be over strength in that rank. So I told him I would go to Okinawa, because at least there, even though I would almost certainly not be promoted, I could contribute to the war effort.

Thus, early in July, 1945, with the war in Europe having been over since May and with the American people's attention focussed on Japan and the Pacific, we left China.

OKINAWA

It didn't work out that way. First there was the fouled-up trip to get there that was like some episode in a book or movie. Our orders directed us to proceed to Clark Air Base outside Manila to receive further orders. As at Langley, we loaded up all the radar stuff we might need along with our key technicians in our 18 planes and went to Clark. We had been told there would be appropriate facilities on Okinawa, such as shelter, work places, tools, etc., so it would not be like going to China. After a couple of days at Clark we received our orders. Instead of telling us to proceed to Okinawa they told us to go to "Morotai." A little checking informed us that Morotai was an island some distance south of the Philippines, near New Guinea. There was no 7th Air Force base there. We immediately questioned the orders, going to the appropriate people at HQ. We had no one with us like our commander, Colonel Hopson, who had originally made the arrangements for our squadron's transfer. There was no explanation. Those were the orders. We climbed back in the planes, which were still loaded, plotted a course from aeronautical charts of that unfamiliar area and set out.

We found Morotai without incident and landed. We were finally greeted by an officer who wanted to know who we were. We were not expected; no one knew what to do with us. After a couple of days in the tropical heat and nights in some tents they found for putting us up, we received new orders to go back to Clark. It had been a mistake. It was back to Clark.

New orders at Clark directed our 373rd Squadron to proceed to Yontan Field on Okinawa and the 7th Air Force. We were now pretty bedraggled, having been en route for over a week with no change of clothes.

Although we knew the United States was certainly on its way to victory, we had no idea that the end of the war was less than a month off. We were aware that our B-29 bombers were bombing the major cities, the defense installations and the infrastructure of Japan but we had no knowledge that there was such a thing as an atomic bomb and that two of those planes would drop them with such devastating effect. We anticipated a long, cruel process of wearing the enemy down and then probably a bloody invasion of Japan itself.

On arrival at Yontan on a sunny day in the middle of July, 1945, Major Walt Nyblade, a recent arrival in China, who had assumed command of the 373rd, and I reported to the commanding general of the wing to which we had been assigned. He said they had been anxiously awaiting our arrival, that we had a great reputation as having radar capabilities unmatched anywhere and that the most important thing we could do would be to lead their formations that had started bombing Japan and Korea around and through the weather that had forced them to abort a number of missions. He had heard our radar would enable us to do that; was it true? I told him our crews could do much better at it than could be done without radar.

He told us a major mission was to take off in a few hours. He wanted one of our planes and crews to lead it. We were flabbergasted, but said we would try. A quick check established which planes had radar that appeared to be still working and Nyblade selected an experienced crew that said they would be willing to go. We got the plane unloaded. The crew started to get ready, including taking benzedrine tablets so they could stay awake during the whole of the second flight they would be undertaking that day. They went, and from that day on we had daily flights, normally leading formations.

I arranged to set up shop in an appropriate building, and our technicians, most of whom were from the original LAB project, quickly arranged things so they could do their jobs. We never failed to have the radar ready to go as required.

It was only after we had been there a couple of days that I had time to start looking around to see what support facilities might be available to us. To my amazement I discovered that all the planes in the B-24 group to which we had been assigned were equipped with radar just like ours, all their crews had

received the same training in the states as had ours. Furthermore the base depot had a fully equipped and staffed radar shop with complete supplies of parts, test equipment, etc., with the capability of doing all echelons of equipment repair and overhaul, matching anything available in the continental U.S. When I went back to the general and asked him if he knew that the unit he had been commanding had all the same capabilities as ours, he said he did not. That did not surprise me after our trip to Morotai. I had learned about foul-ups and that the unexpected was to be expected in the huge operation that was being undertaken. In any case he wanted us to handle all the radar duties for the wing.

That was about July 25. Our crews and maintenance men settled down to doing the job of leading formations. There may have been some sea sweeps. But on July 30, two weeks before the war was to end, I found myself standing next to one of our planes which had just crash-landed, badly shot up and with crew members killed and wounded by anti-aircraft fire. I was to meet the salvage officer there to arrange for the removal of any radar equipment worth saving before the plane was dumped in the ocean. A fighter taking off went out of control, went off the edge of the runway and crashed directly into the plane next to which I stood. There were eight bombs still in the B-24 because the damage had made it impossible for the crew to release them on the way back. The explosion and fire set me afire and ended my active work in the Air Corps. I was evacuated by air and, after a year in Army hospitals, retired for disability. On the date of retirement I was promoted to the rank of major.

RESULTS

The Group received two Presidential Citations in addition to the other citations mentioned above and below. They were based on some impressive statistics.

According to an article in the January, 1983, issue of *Air Classics*: "On 11 October, 1944, the Twenty-Fourth Statistical Control Unit of the Fourteenth Air Force sent a secret memorandum to the Commanding Officer of the 308th Bomb Group. It compiled the shipping destroyed and damaged by the Group during the period of 1 April 1944 to 10 October 1944. It listed ninety-three ships destroyed for a total of 306,800 tons. It showed twenty ships probably destroyed for a total of 55,600 tons; and thirty-four ships damaged at 79,300 tons. The total of ships sunk, probably sunk, and damaged was 147, for a total tonnage of 440,500 tons." This was accomplished by a total force of LAB planes that averaged fewer than 15, of which only two or three were active per night.

This compares with the figures from Samuel Eliot Morrison's, *History of U.S. Naval Operations in World War II* of a total of 868,361 tons of Japanese warships and merchant vessels sunk by all the submarines of the Navy from September through November, 1944. Our small band had accounted for almost half as many tons as all American submarines.

The totals go beyond this. At the request of the Navy we had undertaken the mining of the major harbors within our range. They marked on charts the places they wanted the mines laid with respect to terrain features we agreed could be seen on our radar; our crews dropped them at night from low altitude at these well-defended locations. Sometimes they encountered heavy enemy fire. It was easier to assess the results of these missions. Daylight photo reconnaissance showed dozens of ships frozen in place, sometimes for weeks at a time. Undoubtedly others were sunk or damaged, but we never made any claims on that score.

Another perspective occurred to me as I was writing this. During the recent Gulf War, I, like millions of others, watched the remarkable film shown repeatedly on TV of a guided bomb hitting directly on the ventilation opening of a building in Baghdad: I marvelled at its accuracy. Now I think of our crews' many successful attacks on shipping. Many of those attacks scored direct hits, some on heavily defended warships, some on relatively small freighters. Our skilled and determined crews, particularly the pilots, navigators and, above all, the bombardiers, combined with diligent maintenance and calibration of the relatively primitive equipment we were using, produced accuracies that rivalled what we saw in Iraq. And our crews never saw the targets until the bomb exploded; didn't even know what the target was in advance!

In a report of the Strategic Bombing Survey that was given the task after the war of assessing results of allied activities against Japan there is a fascinating account of an interview with a prince of the Japanese royal family, who was a member of the council that made the final decisions on major issues of the country's policies, including the decision to surrender. He stated that one of the most important factors that pushed the council to view their country's situation as hopeless was the supply problem. They had lost the ability to bring the necessities to the homeland. Their large fleet of freighters had been hopelessly decimated. And what remained of it was almost impossible to operate because of the problem of the low morale of seamen. Large numbers of them simply refused to serve any longer because they felt the risks had become too high. The knowledge that even at night they would be attacked without warning by unseen planes had a terrorizing effect that caused the complete breakdown of Japan's sea transportation system.

In a way this bears on one of the factors that distinguished the focus of the Hopson Project from the other missions of the Fourteenth Air Force. In general those were always tactical missions, supporting the Chinese army's efforts to save as much of China as possible from the Japanese. Our work had a different goal. It was really an early part of the strategic effort against Japan itself. In the Pacific, as well as in Europe, it was really the strategic war which produced the enemy's defeat. Against Japan the ground forces of the United States were used effectively and heroically to establish bases for the ultimately successful strategic war. That was the war of which we were a part.

A broader description of the results of our operations appears in the text of the commendation bestowed on the 308th Group on August 15, 1945. In General Orders 114, by command of Major General Charles B. Stone III:

"Between 24 May 1944 and 28 April 1945 this group preyed relentlessly on the Japanese sea shipping lanes between the Japanese homeland and her conquests throughout southern Asia and adjacent insular territories. During most of this period, this Group was the only organization among all the Allied forces in a position to conduct interdiction operations against this vital supply line. Operating from bases in China the Group swept the East and South China Seas, the Straits of Formosa and Gulf of Tonking through all kinds of weather, sinking and damaging nearly three-quarters of a million tons of vital Japanese shipping. They sank 107 merchant vessels and sank 12 enemy naval vessels, including three cruisers and seven destroyers. They probably sank 29 vessels and damaged 48, for a total of427,252 tons of shipping sunk, 102,765 probably sunk and 187,045 tons damaged.

Pressed by the constant need for economy of operations from air-supplied China, the Group forsook the usual high altitude style of bombing to attain accuracy and minimum expenditure of bombs. Heroically and deliberately the combat crews developed and employed low altitude tactics that brought their slow, heavy bombers down to within 400 feet over entire convoys of eight to twelve armed merchantmen and naval ships. Throughout the cited period the Group was forced to fly much of its own gasoline and bombs over the "Hump" (Himalayan Mountains) into China, and in the same period was forced to evacuate from three bases before the advance of enemy ground forces. For several months the Group launched its sea search missions from a base behind enemy lines in east China. The phenomenal achievements of the 308TH BOMBARDMENT GROUP (H) in its interdiction of these vital enemy shipping lanes are the results of extraordinary heroism, gallantry, determination and esprit de corps demonstrated by the members of this organization. Their attainments are consonant with the finest traditions of the American military service."

The world little noted the work of our project's crews and technicians. It was secret. Then Hiroshima and Nagasaki took over the headlines, followed by the surrender. The records of the 308th's activities were set aside in files, ultimately declassified, gathering dust in Air Force archives. But the Hopson Project people will long remember what they did there.

The LAB record is what it is because of the remarkable combination of open-minded and innovative command people to whom we reported: from Gen. Chennault through Colonels Fisher, Armstrong and, above all, Hopson.

APPENDIX

The Low-Altitude Radar Bombsight, AN/APQ-5 (LAB)

The AN/APQ-5 was designed to provide an electronic analog to the Norden high-altitude optical bombsight.

The function of a bombsight for gravity bombs is to determine the aircraft heading for the bomb run, along with the release point for the bomb. It must take into account the aircraft's altitude and its vector velocity with respect to the ground, and therefore the target. The altitude can be readily determined from the standard altimeter and the knowledge of the elevation of the target; it can be input to the bombsight manually before the bomb run, and the pilot makes certain he flies at that altitude. However, the plane's flight path and speed with respect to the ground could not be determined from the aircraft's instruments at that time. They gave only the velocity with respect to the air, which differed from the ground velocity by the magnitude and direction of the wind.

The Norden sight used a gimballed motor-driven telescope (which the bombardier kept centered on the target) and a mechanical analog computer to determine the plane's vector velocity. From that and the altitude it predicted the bomb's trajectory and established the proper heading and the release point. At high altitude the angular velocity of the line of sight to the target as the plane approached bore with reasonable accuracy a linear relationship to the ground speed.

The beam width of the 10-centimeter radars available in 1944 was far too wide to permit the accurate determination of the angle of the line of sight to the target. Also at low altitude the rate of change of that angle is far from constant and is no longer a linear function of ground speed. But radar did accurately determine the slant range to the target, which a telescope has no way of doing. In addition at low altitude the rate of change of range (range rate) is close to a linear function of ground speed. Therefore the LAB sight was designed to determine the range rate with electronic circuits.

The designers were savvy enough to work from the assumption that the bombardiers who would use LAB would have been trained in the use of the Norden sight Therefore they made the bombardier's controls as much like those on the Norden sight as possible: two sets of knurled knobs, the left-hand ones for adjusting, the input of velocity along the line to the target and all the right-hand ones to correct for wind drift at right angles to that line.

John Keto was Project Engineer on radar at Wright Field, Ohio, in 1939, and Chief Engineer of the Radar Lab established there by the Army soon after. He remained as Chief of the Air Force Radiation Lab at Wright-Patterson Air Force Base until he retired. When I asked him recently who had been smart enough to make the bombardier's interface with LAB physically like that of the Norden sight even though what it controlled

was completely different. Keto said he guessed it was he. But, he said, "It just seemed like the obvious thing to do."

REFERENCES

[1] Chennault, Claire Lee,
Way of a Fighter—The Memoirs of Claire Lee Chennault, Major General, U.S. Army, (Ret.),
G.P. Putnam's Sons, 1949

[2] Haynes, Elmer E.,
General Chennault's Secret Weapon—The B-24 in China,
edited by A.B. Feuer,
Praeger, 1992

[3] Samson, Jack,
Chennault,
Doubleday, 1987

[4] Crawford, Raymond,
Ship-Busting Liberators,
Air Classics, Vol. 19, No. 1, 1/83

[5] Samson, Jack
Nitemare's Secret Score,
Air Force Magazine, Vol. 73, No. 4, 4/90

Edward G. Menaker (M 53, SM'60, LS'87) received an AB degree in 1938 from Columbia College and an MA in French from Columbia University in 1939. He was commissioned as a Communications Officer in the U.S. Army Air Force and served as a Radar Officer in the Caribbean and China.

He spent over thirty years as an engineer and engineering manager for General Electric. This included eight years in airborne electronics and weapons systems, with the balance in industrial electronics. For one year he was Manager of Value Engineering at Compagnie Bull-General Electric in Paris.

Since his retirement he has done consulting in reliability engineering and software development and documentation.

He is active in his home region as a volunteer with a health planning agency, and an organization promoting closer cooperation between employers and the public schools.