THE MANHATTAN PROJECT

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Prologue - April 2001

At a recent church service, one of our ward (congregation) told of his son's missionary experiences in Tokyo. While there he brought the Gospel to a Japanese family that had a young son. That son, upon reaching the required age of 19, then became an LDS missionary in Horishima. This has brought great comfort to me in knowing that these people are now receiving, by proxy, some recompense for the suffering brought about by their government.

As history has now come full circle, I have decided to provide an autobiography of my experiences during WW II. This is not to appear self laudatory, but is the best way for me to explain to the generations of my family, present and future, my experiences as a participant in developing the atomic bomb. I hope that the reader will not observe me and my colleagues as monsters, in that our actions resulted the loss of life of ten of thousands of Japanese people. In the text following there will be found valid reasons for the development and use of this horrible weapon.

At the University of Idaho - 1939 - 1943

In my high school and university years I had been enrolled in the ROTC programs for seven years and was looking forward to gaining a commission in the Army upon graduation.

The winter and spring of 1943 were becoming tense with regard to graduation, the draft, etc. Our 1942 ROTC summer camp had been cancelled due to the War and there was much speculation about receiving our commissions upon graduation. The draft boards were scraping the bottom of the barrel and were exerting great pressure on the Army to draft those deferred due to ROTC training. As a ploy the Army directed that we would enlist in the "enlisted reserve". In January we went to Spokane for induction and returned to Moscow in civilian clothes. Then in April we were ordered to active duty and were sent to Fort Lewis, Washington for processing, uniforms, etc. We had left wives and friends as college students in civilian clothes and returned to alight from the train as just GI's in OD wool uniforms. Apparently that was somewhat of a let down for the ladies.

Upon returning to Moscow, confusion reigned. At first we were supposed to live in dormitories and eat our meals there. However, those that were married were soon permitted to remain in our houses or apartments. These priviledged few drew a princely sum of $25 per month for quarters allowance. Additionally we received $30 per month private's pay. Since Betty Jo had a job in the English Department at the University, we made out quite well.

By now the Army had determined that, upon graduation, we must attend Officer Candidate School, as a substitute for the missed 1942 summer camp, in order to receive commissions. If one failed at OCS he was just a private in the Army. This

was disheartening after years of high school and university ROTC, but there was no alternative. To rub salt in the wound, an officer from the Army Signal Corps came to the campus in the spring offering direct commissions to electrical engineering seniors. When he found I was in the enlisted reserve there was no deal!

Beginning of active Army service - Spring 1943

Our ROTC unit was infantry oriented. After graduation the four of us graduates in engineering were to be sent to the Combat Engineer OCS at Fort Belvoir, Virginia. Typical Army planning, or lack thereof, dictated that we remain in Moscow until openings were avaiable in the OCS classes. This made it necessary to give up our apartment.

However, time staggered on with no assignment to OCS so we were allowed day by day passes to work for the local farmers who could not get civilian help. During this time Betty Jo and I camped out in the guest room of the Sigma Nu house. The delay proved to be a blessing as the hard work on the farms toughened us up for what proved to be extreme physical requirements at OCS.

On 7 August 1943 the four engineer types shipped out on the train to Fort Belvoir, leaving wives behind with an uncertain fate ahead. Mine was especially difficult as there was a new life stirring within Betty Jo.

Fort Belvoir- August 1943 - January 1944

Fort Belvoir is a major Corps of Engineers post and training center about thirty miles from Washington DC, on the shores of the Potomac river. Upon arriving at Fort Belvoir on 12 August 1943 we found there was no opening in an OCS class for us.

This was most disheartening and at that was only the beginning. We were placed in a "holding copmpany" for about four weeks and had the joyous experience of OCS discipline and tormenting by the "Tactical Officers", while not receiving OCS credits for these indignities. When we finally were placed in a class the real pressure began, physical, emotional and academic. The OCS staff, though appearing beastly, had a serious purpose for their treatment of the candidates. They were given the responsibility of training us to be leaders in only a four month's period and separating out those that would crack under pressure. I witnessed several fellows cracking. One example was that when a candidate was being chewed on by the "Tac" he was commanded to respond. His mouth moved but he made no sound. A day or so later he was "washed out" and sent to troop duty as a Private. About 40 percent of those in our class were eliminated during the four months. Some were washed out the morning of graduation. Candidates in other classes told us of this policy and it understandably was a mental burden the entire period. Our physical exertion was such that the generous Army food was not sufficient. I frequently would purchase half pound chocolate bars and bolt one down during an afternoon five minute break. Most people lost weight but amazingly I gained about fifteen pounds.

There was no such thing a privacy in the barracks. Our platoon of 32 men was grouped on each floor of the 2-story building with cots around the walls and a row

down the middle. My cot was one in the middle. After studying until "lights out" I would pull my blanket up over my head and with a flashlight write to and read letters from Betty Jo.

There was not the romanticized morning "reveille" bugle to wake us. Instead the sergeant would sneak into the barracks and taking a big breath would blow a whistle at about the sound level of a locomotive horn. The result was pathetically humerous. Thirty-two wraiths would erupt violently from their cots and proceed into the morning ritual and chores. The first was to shave and dress. Bathing was out of the question as there was seldom hot water and time could not be spared for such pleasures. Thus, the "Saturday Night Bath" became necessary. We didn't wear pajamas as they would have to be removed each morning and stowed in one's foot locker; thus, were an unjustified luxury. Since we always wore the same underwear for several days, more time was saved.

Upon arising (or more accurately erupting) we folded our sheets, mattress and blankets, lining up two edges in the stack to 1/8" tolerance. Sheets were a loss of time thing to fold, so none of us used them and left them permanently folded. After dressing one had to sweep around your cot then mop the same area. With only two brooms and mops per floor, this took considerable negotiating and coordination. After fifteen minutes of such joyous action we fell out for morning formation whereupon we found out what the fun and games were to be that day.

Breakfast was then enjoyed copiously endowed with "grits", the national dish of the South. I believe this dish was the final revenge the Southerners wreaked on us in retaliation for losing the Civil War. We could not leave the sumptous repast until all were allowed to go. A mad dash was then made back to the barracks to check our clothing on the racks and at the cots to see if the Tac officers had slipped in and moved or unbuttoned something. They took great pride in giving us demerits for discovering such a henious crime. The rest of the day was spent in various classroom and field training up to supper time. In the South "dinner" is at noon. After supper we were in classes or study hall until "taps". The latter was another (outside this time) police type whistle.

The academic training was of first quality. The tactical training (infantry oriented) was conducted by officers with battle experience. The engineering schooling was conducted by officers with much practical experience and many were university professors. Little engineering theory was taught and greater emphasis was on practical field problems - learning the hands-on use of all sorts of heavy construction machinery, explosives, road building, bridge building, etc. It was intense enough that the few members of our company that were not graduate engineers had some difficulty in keeping up with the pace of the courses. Infantry tactics were taught by the Tac officers.

Our only free time was Saturday evening and Sunday until 6:00 PM. That is, unless one had amassed demerits and had to serve extra duty during the normally free time. After two months we could get half-day passes. One was Saturday evening and the other was daytime Sunday. The rakes in our group opted for Saturday night in Washington. I took mine on Sunday and would attend the LDS church in the

Washington Stake Center then attend a movie or visit the Smithsonian.

About a month before graduation a Corps of Engineers Major came to the OCS headquarters and asked to interview the academically trained electrical engineers. He asked me a number of electrical questions including those about large transmitting tubes. In addition, he was interested in my family background, hobbies, moral standards, etc. He was told of my being raised in a military environment, my father being a West Point graduate. I explained to him my LDS Church affilliation and its moral standards. Apparently this impressed him. He did not indicate for what assignment the recruiting was being conducted or what organization he represented. I answered his questions to the best of my ability and soon forgot about the incident.

Near the end of our training we were asked to indicate our preference for assignments. I selected, in order of priority, communications officer in a construction regiment, construction battalion and airborne engineers. As the Army is prone to do, none were available upon graduation. Two days before graduation we received our assignments, mine being a casual replacement center at Fort Leonard Wood, Missouri. This was the worst possible as that meant being sent to a combat engineer platoon, where the casualty rate for lieutenants was higher than most infantry units.

Our graduation was set for noon on Saturday. On Friday I had procured new uniforms, etc. and had Railway Express pick up my foot locker for shipment to Ft. Leonard Wood. Later that evening I was summoned to the orderly room and told that my assignment was changed, but they didn't know where. A frantic petition to Railway Express retrieved my foot locker.

In retrospect, I now know that the one month interval and the next episode was devoted to an FBI background check for security purposes.

<u>Oak Ridge Tennessee- January 1944 - July 1946</u>

After graduation the next day, my printed orders read: "Manhattan Engineer District, Oak Ridge, Tennessee". I then took the bus to Washington D.C. and visited with a couple who were long time friends of my parents. After visting with them I went to the Union Station (railroad) and asked the clerk for a ticket to Oak Ridge, and then the frustration commenced. The clerk could find no such town on his records. A similar fate greeted me at the Greyhound Depot. Things were getting serious as my orders called for me to report the next day at Oak Ridge. In desperation I called the Pentagon and got the weekend duty officer. It took him about thirty minutes to come up with a post office address for the Manhattan District in Knoxville. This assured me so a ticket was purchased for that city. My presumption that Oak Ridge was merely a subburb of Knoxville. Had I been assigned to the Chicago office of the District, it would have been traumatic as that was merely a post office address for a detachment in northern Canada.

Upon arriving in Knoxville, I went across the street from the depot to a barber shop to freshen up and get a shave. All the other customers were civilians. Upon asking them where this "Oak Ridge" was I received strange facial expressions from them. Finally one said that I should go down the street to the office of the Tennessee

Eastman Company as they were contractors at the site. That company's personnel got me on the next company car going to Oak Ridge.

About twenty-five miles from Knoxville we pulled up to the first band of security gates where more confusion reigned. Since I had no pass I couldn't enter. A call to the Officer of the Day (OD) at the District headquarters didn't immediately allow entrance as that office had no notice of my arrival. However, after the security examined my orders I was allowed entrance. The OD arranged for me to be dropped at a BOQ (bachelors officers quarters). A car came to pick me up the next morning and took me to Site Y-12, where I reported to a Major Kelley, my immediate superior.

Security and secrecy

At this time I became aware of the enormity of the operations and its purposes. A briefing session with Major Kelley indicated that once I received certain information, I would never be sent to a combat unit. For a twenty-one year old second lieutenant, this was an overwhelming experience. He then indicated that plant was producing a Uranium isotope by electromagnetic separation based on the device invented and developed by Dr. E. O. Lawrence of University of California, Berkley. The security indoctrination then began. We were never to discuss certain items within eyesight of persons not privy to this information for fear that they could read our lips. Also, thereafter only code words were to be used for designated materials and apparatus. He then spelled out the purpose of the plant that was to produce the materials for a nuclear bomb based on the theory of relativity of Albert Einstein. Now, I began to put the pieces together. The interview at OCS was done a month before graduation to allow time for a complete security check of me by the Army and the FBI. Major Kelley said that my assignment was permanent unless I failed completely then a transfer would be made to a "Pack Mule Platoon in Panama". Under no circumstance was I to reveal to any family member or friend what my assignment was or what the purpose of the plant was, other than the Manhattan Engineer District. That evening I telephoned Betty Jo to tell her that I was in Tennessee and not at Fort Leonard Wood and that it was a secret base and nothing more could be said. In spite of being there over two years she never did have any idea of the product, if any, or the purpose of the plants.

I was one of the first company grade officer (lieutenants and captains) to be assigned to this site. Within a few days a few more lieutenants arrived and were assigned to Y-12. The other were majors and higher who had earlier been assigned to supervise the construction of the installation. I later found that, except for Col Nichols the commanding officer, all officers were reservists with a minumum of undergraduate degrees and many had masters and PHD degrees. We were assigned to expedite the functions of the civilian contractors that built and operated the plants. Y-12 was designed and built by Stone and Webster of Boston and operated by a subsidiary of Eastman Kodak: Tennessee Eastman Co. Since we needed to know all about the construction and operation of the plant some of us were given "Top Secret" clearance and could see and create documents up to and including Top Secret. The latter is a story in itself as each top secret doucument was serial numbered and cataloged. If such a document was reproduced or sent elsewhere a record of its travels could be traced.

The Lost "Top Secret" Document

Our office had a vault lined with 4-drawer file cabinets containing classified documents. One day a top secret document could not be found. The poor WAC (Women's Army Corps) girl about died as the filing and security of that document was her responsibility. So, an officer was assigned to each filing cabinet and every sheet of paper was examined in a attempt to find the missing item. Finally it was discovered stapled to the back of another document.

Oak Ridge consisted of several production, experimental and living areas including the main town site of 75,000 population, which had been carved out of the east Tennessee valley. Each adult living in Oak Ridge, or working there, had a photographic identification badge for entering the overall reservation which was was about ten by twenty miles. If one worked at the headquarters of the District or at one of the production areas they excanged their badge at the next gates to those areas for one that had security infomation printed on it. One symbol indicated the level of classified information allowable, one the type of information available and the third the areas accessible. A third band of security was at certain interior spaces where one had their name on a list to permit entry. One carefully examined onother person's, badge if unkown, before any discussion of the processes commenced. One day, while I was taking some data down while in a Y12 plant a civilian asked me about the equipment performance. I looked at his badge and found that he had the highest level on all three categories and answered his questions. I did a double take when looking at his badge more closely saw the name "E. O. Lawrence". Here was a very young 2nd. Lieutenant trying to calmly tell the system inventor what was happening.

Except for the Colonel in command at Oak Ridge, essentally all my fellow officers were reservists. Many had advanced degrees in engineering, physics, chemistry, etc. Military protocol was not evident as we were there to perform a serious task. As such, frequent saluting, formal uniforms, social calls were not a part of our daily lives. The more of these men I met, the more I appreciated my being selected to join them.

Oak Ridge - the Manhattan District Headquarters

The headquarters building consisted of several, two-story, wooden office buildings connected with passages. This complex had an added security band and fence, requiring special authorization for entry. This building was the nerve center for the entire District and the far flung installations, such as the Hanford plutonium plant and the Los Alamos laboratory.

General Groves and his Deputy, Colonel Mitchell, operated from the building.

As a Lieutenant, I had little contact wtih General Groves. After the war was ended and my father could be told of my assignment, a strange coincidence arose - General Groves and my father were classmates at West Point - small world.

Each night and officer was delegated to be Officer-of-the-Day and spent the night in the building. By stroke of luck I was OD on 8 August 1945, just missing the Hiroshima incident of 6 August. By the 8th, the news media was frantically trying to gain access to Oak Ridge for publishing materials. Needless to say, it was a busy

night.

Oak Ridge - the Plants:

Several plants were distributed within the reservation. The following are brief descriptions:

Y-12

The plant where I was assigned, had several production and chemical processing buildings where the U235 isotope was separated by the electromagnetic mass spectrographic principle. The natural uraniam was chemically converted to uraniam hexafloride (UFL_6). This material was coated on a heating coil similar to the filament on a television picture tube. This was a component in a large device having high voltage electrodes and a carbon target. The assemblywas about two feet wide, ten feet deep and fifteen feet high. The assembly, along with many others was placed in a tank in the magnetic assembly and all air removed to become a vacuum. The tanks were grouped in an oval assembly nickmamed the "Racetrack" because of its shape. Busbars ran aound the top of the oval to supply direct current electricity to the magnetic coils located between the tanks. So much power was transmitted to the magnets, that the bus bars had to be made of silver which is an excellent conductor of electricity. The bulk of the silver stored at Fort Knox was fabricated into these bars.

There were two Racetracks in each production building. The magnet power supply for each Racetrack consisted of a 20,000 horsepower motor-generator. So much power was required, that the electricity from three TVA dams was used. Thus, the choice of eastern Tennessee was ordained.

Each of the separation assemblies was served with high voltage electricity to accelerate the gas particles in their semi-circular, magnetically curved, orbit from source to target. The technology, of the day, did not provide automatic controls. As such, 24 hours per day, each assembly required an operator to adjust the voltages to keep the beam properly aimed. With several hundred assemblies, the number of personnel is obvious. It was tedious work as the operators sat at control panels observing the meters that reflected the beam's actions and aiming the beam controls controls by turning control knobs.

After it was determined that the targets had absorbed the desired amount of the isotope, the vacuum was removed from the respective assembly and the assembly withdrawn. The targets were then removed and sent to the chemical plant for the extraction of the metal isotope.

After passage through this first separation process, the enriched uranium was sent to a second, similar plant for further enrichment. Thereafter the materials were sent to Los Alamos.

Oak Ridge - the "City"

The Reservation, containing the plants and Oak Ridge "City, is located about 25 miles west of Knoxville, Tennessee. The Reservation is about ten by 20 miles in within the security area. There, were then, several living areas along with stores, theaters, hospital, etc. to serve the population of about 75,000 military personnel and workers and their families. Housing consisted of wooden dormitories for singles, mobile home type of dwellings and permanent housing. The latter were assigned to military officers and civilian mangement level personnel. There were isolated barracks type housing compounds for enlisted military personnel and segregated, black workers.

As the shopping, in Oak Ridge, for families was limited, and few people had cars or gas to operate them, the civilian administration provided busses to allow travel to downtown Knoxville. These were semi-trailer beds with wooden housings and hard benches. The wives named them the "Cattle Cars". However, it was wartime and all took them in stride.

Gasoline rationing made trips to the Smokies and other recreational areas beyond the limits of one family. So, by pooling a month's supply of ration cards, two or three families could get about fifty miles away. This was little help if one had a bad tire as these were also rationned. It sometimes took several weeks of negotiating to obtain a tire purchase permit. Travel, then, was far different than today's high speed travel - as the nationwide, Federal, speed limit was 35 MPH.

The First U235 Production

I had arrived at Oak Ridge on 13 January 1944 and on the 27th of that month witnessed the first production of U235. U235 is the fissionable isotope (material) which constitutes 0.7% of the natural uranium metal and extracted from the natural state by electromagnetic separation. A few weeks later I was directed to go to the chemical processing plant to pick up a small vial of U235 for delivery to Los Alamos, New Mexico. This vial was packed in a 6" cube wooden box and was the entire production of U235 of the United States and probably worldwide. Such experiences are not often afforded to 21 year old lieutenants. Needless to say the enormity of the incident was overwhelming.

On 15 March 1944 Nancy Patricia O'Rouark arrived at St. Luke's Hospital in Boise. About a month previous to that date I had wrangled a ten day leave to be in Boise for her birth. See the leave orders following this section. After much discussion with her doctor, Betty-Jo was told that if I got to Boise on the 15th it would be a few days before the big event. I left Oak Ridge on the 13th and transferred to the City of Portland "Streamliner" in Chicago at 6:00 PM and arrived in Boise at midnight the 16th. Since Betty-Jo had no means of contacting me enroute, she could not let me know that stirrings commenced on the 14th. The train made a stop in Pocatello in the early evening. I got off and purchased that morning's Idaho Statesman. In the birth announcements I read that a Mrs. T. O'Rouark had given birth to a daughter. At Boise, upon alighting from the train, I asked Betty-Jo's father how Betty-Jo and our daughter were doing. He was mystified as how I had found out and was told about the newspaper. The next morning I had the overwhelming pleasure of seeing Betty-Jo

and the baby the nurses called "Princess". We enjoyed a few days together until I had to return to Oak Ridge. Unfortunately, after I left Betty-Jo developed phlebitis in one leg and was bed ridden for several days.

Upon returning to Oak Ridge an effort was made to get housing on the base. Junior officers were low on the priority list and none was available. The only resort was to arrange for a room, with kitchen priviledges in a home with a woman whose husband had died. Betty-Jo, Nancy and my mother came by train in May 1944 to arrive in the hot, humid Tennesse weather to the railroad station at Oliver Springs. I picked them up there in an Army sedan and gave them their first experience in war time security. After a few days my mother returned to Coeur d'Alene.

The sharing of the home with the widow was, understandably, tense and unsatisfactory. We set out to find housing in Knoxville, about 25 miles away. When the Army found that this was being considered, they relented and allowed us to move into a two bedroom house.

By today's standards it was barely above cave dwelling. However, we felt fortunate to be together and in our first home. The streets were unpaved gravel with copious mud and puddles. The sidewalks were straight out of "High Noon" - being board slats. Since there were sizeable gaps between the planks, the unwary were often tripped and found impregnated with mud and slivers. As such, Nancy learned to walk on them and developed an uncanny trait of picking up slivers on exposed flesh.

Progress towards the bomb and the problem of conscience

We were led to believe that the bomb, if it worked, would provide an enormous explosion and searing heat. Also, there would be radioactive injuries and fallout. Our concern about this horrendous event was mollified by the following explanation. Based on the psyche of the Japanese people and the losses being suffered in the Pacific invasions by both the United States and Japan, hundreds of thousands of military, naval and civilian casualties would result from an invasion of Japan. By the beginning of 1945, Japanese cities were being decimated by bombing and tens of thousands of civilians were being killed and wounded.

When Okinawa was invaded, the prognostigations of losses were confirmed by the fanatical actions of the Japanese soldiers and their generals. The thoughts of foreign invaders in their homeland caused the populace to adopt a fight to the death attitude. By this time the United States military leaders determined that an invasion of Japan would result upwards of one million Japanese and American casualties.

President Truman was forced to consider the immediate losses by the bomb as compared to the potential invasion losses. His decision has been discussed, criticized, analized, damned, etc. for fifty-six years. This will probably continue for generations. However, the "bomb" did not win the war it ended the war.

I did not and do not have any regrets in serving my country as assigned. I recently read a book *Duty* consisting of interviews with Col. Paul Tibbets, the pilot of the B-29, Enola Gay delivering the bombs to Japan. His thoughts on using the bomb are almost

identical to mine. My father was a West Point graduate and lived under its motto: *Duty - Honor - Country.* His example molded my thoughts and actions through high school and college. As such, my entering the Army, to me, was a duty not to be dismissed and an honor to my father and country.

Epilogue:

And now with the missionary of the second generation returning to Hiroshima, the circle has been completed.

Had the US not had the atomic bomb at the end of WWII, I truly believe that we would have had a land war with the Soviet Union. That country was determined to take over all of western Europe and only our superior nuclear position forestalled such a catastrophe. Then, with both super powers having atomic and hydrogen weapons, a stalemate has ensued.