I've been asked where I got my training and what qualifications were required to land the REO (Radio Electronics Officer) job. The qualifications for the job included several licenses and certificates from the Federal Communications Commission (FCC) and US Coast Guard (USCG). Each of these required examinations to qualify. Amateur radio operators are used to this program, with a series of license classes, each with a test of some kind. In the commercial world, there is a similar structure, with a series of "Elements" that must be passed in order to earn a license. For the REO position, a Commercial Radiotelegraph Operators License, either T1 or T2 was required. The Elements required to earn one of these include Morse code sending and receiving, an extensive technical knowledge of electronics in general, and specifically high-power Marine equipment, power supply systems, operational procedures, and US and international radio law. Later, when GMDSS came along, at least a GMDSS Operator license was required, and a Maintainer license for anything beyond front-panel adjustments. Like any examination, one learns the material and takes the test.

The USCG Merchant Marine Radio Officer License required a list of documents, with the one difficult-to-get item, a Letter of Intent to Hire from a shipping company.

Those REOs I've talked with each had a different path to employment in that capacity. Most were in one or another military service, usually the Navy or the Coast Guard. That was good preparation for some of the military traffic we handled, but was less comprehensive with regard to civilian traffic and the general operations of the radio department. The biggest deficit was in troubleshooting and repair. Military equipment is usually maintained by repair specialists who troubleshoot to the sub-assembly level and then replace that assembly. This method depends on elaborate supply lines and a stockpile of spare parts. Operating as a civilian ship, our only supply lines were "buy it ashore" or "have it shipped out by the home office to some future port of call." Either way, replacement sub-assemblies, especially for older equipment, were fairly scarce.

I have a Bachelor of Science degree. I took physics and chemistry, but no electronics courses, as such. I picked up my electronics knowledge in Industry, spending much of the 1970's in Silicon Valley, the southern end of the San Francisco Bay Area. This area grew dramatically during this period. Advances in electronics produced a boom, starting in the 1960's and continuing well beyond the 1990's.

I worked for three different small (about 25 employees) companies. The first repackaged off-the-shelf radio equipment for international sale as complete systems, mostly to Africa and South America. One example was a radio network for a small mountainous country that wanted every post office in every town to have a VHF radio station that could reach back to the national Headquarters using solar powered repeaters on mountains. That was a 2-year effort, during which I learned a whole lot about radio engineering, modification and deployment. At one time during the negotiations with the government representatives, we asked, "What frequencies are assigned in your country for this sort of government operation?" The answer was, "What frequencies would you ***like*** to have assigned?" My titles were Engineering Technician, Production Supervisor, and Production Manager.

The second company manufactured similar equipment from scratch. I was again a Production Supervisor, Production Manager, and Engineering Technician. The engineers designed a radio, and produced drawings. Then, the Engineering Tech fabricated a prototype and made it work, correcting the mistakes on the drawings. One product was a paramilitary Man-Pack HF transceiver. It used thumb-wheel switches to set the frequency (1.5-35 MHz), and had a Phase-Locked Loop master oscillator. This was cutting edge at the time. The Voltage Controlled Oscillator (VCO) would not cover the entire required range, even though it "should have" according to the Engineers. In the discussion, the problem boiled down to the tank coil not having a high enough "Q", too much resistance for the available inductance. This looked like an "insurmountable problem". I said, "Silver has much less resistance than copper for the same inductance. Can we make the VCO coil out of silver wire?" The Purchasing Agent picked up 3-inches of same-gauge silver wire, I wound a new coil, and the circuit worked perfectly. I just liked electronics and liked learning everything I could about the subject.

The third company bid on custom systems, designing, developing and fabricating. We built a lot of different types of Burn-In Ovens for the semiconductor memory business, and other one-off projects of all descriptions, including the internal telephone system for BART (Bay Area Rapid Transit system). Here my titles were, Purchasing Agent, Production Manager, and Field Repair Engineer. I would prepare estimates on what it would actually cost to build a project, usually while the engineering was still in the arm-waving stage. Then once a contract was landed, I would order the parts in, and oversee and assist a team of 4 very skilled women who would actually assemble whatever it was. Basically, that meant I was busy all the time.

If there was a failure in a piece of previously sold equipment, I would catch a flight to wherever, with a 50-pound brief-case full of tools and fix the problem. The company ran on a thin shoestring margin, and generally never actually produced the "full set of engineering drawings" that was part of the quote. So, I would be catching a red-eye flight to a place I might never have been, to repair a piece of equipment built several years before that I'd never seen, with no drawings, only basic hand tools, and usually only the vaguest idea of how it worked. This is an environment in which the successful candidate learns very rapidly. I picked up the "knack" of being able to troubleshoot and repair electronic systems quickly and accurately, to the individual component when necessary. This tapped an understanding of physics, electronics learned the hard way, a logical thought process and, eventually, experience.

I had grown up in the Bay Area, and yet, the place had so changed during the previous decade, that it didn't feel like home any more. I was making good money, but not saving much of it. My rented apartment had only the barest of furniture. I ate most of my meals out. I drove a Datsun pick-up, and my friends and I would bolt to the Sierras for weekend hikes, and camping when we weren't working 60-hour weeks. Having spent my school years in Oregon, the Pacific Northwest kept trying to pull me back.

In 1978, I left California and moved to southern coastal Washington, renting a room from a college roommate who needed a handyman to help fix up his house. I worked as a

construction electrical worker, retail store department manager, and set up my own 2-way commercial and marine radio shop. In 1980 I married. We bought a falling-down house, built in 1865, and started repairing it board-by-board. We are still at it.

In 1980, I also earned my Amateur license. As a Ham I operated HF, and VHF, helping out with the area repeaters and teaching license classes. One weekend, in 1988, I organized the local Hams to assemble at a house on the top of the hill in Astoria, OR, to help one of our number install a large HF Yagi on his 3rd storey roof. As providence would have it, this was right across the street from a Merchant Marine Captain who had recently moved into town. He came over and walked around watching the assembly process and talking to people. He finally came up to me and introduced himself. He said, according to the others, I was responsible for this all happening. He asked what I knew about electronic repair, and I answered, “a fair amount.” He asked what I knew about radar, and I answered, “enough to get into trouble.” He asked if I liked ships, and I answered, “I grew up on San Francisco Bay crewing on racing sailboats.” He said he had a Radio Officer who was going to retire soon, and he was looking for someone to replace him. I said it would be a few months before the construction job I was working at was finished, and I would need to obtain some licenses and such. He handed me a business card with his company’s number and a name scrawled on the back.

“When you are ready, call this man at this number and tell him I want you to come to work for me.” Apparently, that’s the way it works.

I drove my coworkers nuts copying Morse code from a cassette tape machine at breaks and lunch, pushing my speed to a commercial level. The commercial exam was more difficult than even the Extra class Ham code exam. The test included receiving plain text (mine was out of a teletype machine service manual) at 20-words-per-minute, with perfect copy for at least one minute out of a five minute transmission. Then receiving at 16-words-per-minute but with random characters. These were five-letter groups, or four-characters if one was a number or punctuation mark. This is very hard because there is no context. If you miss a character, it’s gone forever. There was also a sending test at 20-words-per-minute with a straight key. Five minutes of that is a real wrist work out. I spent a day in Portland with the FCC, taking the code tests and several written elements, and walked out with a T2 Commercial Radiotelegraph Operator license, endorsed for ship radar.

The day after the construction job ended, I made the call. I needed that Letter of Intent to Hire from the company to get the USCG Merchant Marine Radio Officer license. I already had a list from the Coast Guard of all the bits of paper necessary and, except for that Letter, had them all. Three days later, I visited the Marine License desk at the USCG office in Portland. After I laid a number of cards, certificates, letters and finally, a check on the counter, I walked out with a USCG Merchant Marine Radio Officer license. Three days later, I was on a plane to San Francisco to sign aboard the MV Lawrence H. Gianella as a Radio Cadet, to learn a new trade, and finally see what was over the horizon.