

Chapter 17

Radar

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In mid-February 1943, around the time of Goebbel's infamous "total war" speech, I was drafted, barely 16 years old, to serve, as an air force auxiliary (*Flakhelfer*), with an anti-aircraft battery near Stettin on the Baltic Sea. This was to free the regular crews for service on the Eastern front in a futile attempt to make up for the loss of 300,000 experienced men in the battle of Stalingrad.

During unpacking, the battery commander noticed a book entitled *Funkmesstechnik* (radio measuring techniques). But *Funkmess* was also the German word for radar, so I was assigned forthwith to the fire-control radar of our battery, comprising six of the renowned 88-mm guns. There were a total of 18 batteries guarding a huge "hydrogenation" plant that converted coal into gasoline. (It was said that this single plant produced some 25 % of the German fuel that was not derived from oil—a scarce commodity.) Of course, we were "thoroughly" trained—not on a realistic large cluster of aircraft but on single slow-moving planes (*Junkers W34*) pulling air bags as targets. Our radar range data was so accurate that, combined with optical data for azimuth and elevation, we sometimes hit the bag on the first try—and were given the rest of the day off. Once or twice a week there was an alarm: approaching enemy aircraft. But they never got very close, and, after an hour or so, we could go back to our bunks. This got to the point that I never even got up during alarms.

But one night, 21–22 April 1943, matters got serious. I pulled my pants over my pyjama and wrapped myself in a greatcoat. By the time I reached my position at the radar, my screen was filled with a forest of "blips," barely 10 km away. How to pick *one* target in this mess? I selected one of the bigger blips more or less at random. But by the time my two buddies (responsible for range and elevation) had zeroed in on the selected target, it had disappeared and I had to select a new one. The same

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scenario repeated itself over and over again during the entire night. Where did the vanishing targets go; they were not shot down: they disappeared even before our guns could fire a single round.

Pretty soon it dawned on me that the big blips on my radar screen were not really individual planes but the result of random interference of the radar reflections from *many* planes that would add up or cancel each other depending on the (slightly changing) distances between the planes. Thus, we were shooting at “thin air,” random blips, all night. But what to do. I couldn’t possibly run to the battery commander and advise him of the problem (and risking a court-martial). So we moved our servos as we had learned from our single-plane exercises so at least the (analog) fire-control computer wouldn’t go haywire with random input data. Almost needless to say, we didn’t shoot down a single plane all night. After the enemy planes had dropped their bombs (on Stettin it turned out) and left for home, our battery commander jumped on the earthen wall surrounding our radar and, arms akimbo, announced “Boys, I have never seen such smooth data!” (Never mind that we hadn’t hit a single thing.) Of course, we had learned to aim our radar and “properly” track a target even without any real planes present.

The next day was our day off. But the busses weren’t running. They were needed to transport wounded people, it was explained to us. Staring at our radar scopes all night, the thought had never occurred to us that it was a night of great suffering for many.

The Pölitz (now Police, in Poland) hydrogenation plant, in spite of its strategic importance, was never bombed until late in 1943. “Bomber Harris” (General Sir Arthur T. Harris of the Royal Air Force) had simply prevailed with his strategy of carpet bombing of German cities against the many Allied experts who saw a much greater potential for bringing the war to a speedy end by bombing selected targets relating to fuel supplies, rail communications, manufacture of ball bearings, and other German bottlenecks.

In early 1943, an Allied plane was downed near Rotterdam without the (navigational) radar self-destructing so that it fell into German hands nearly intact. *Telefunken*, the German electronics giant, repaired the *Rotterdam Gerät*, as the captured radar was henceforth known, and installed it on top of the Berlin Zoo bunker. Hermann Göring was taken aback when he saw a precise map of Berlin, including its lakes and rivers, on the scope of the reconstituted enemy radar. He rescinded his 1940 order of dropping radar research then and there. In his earlier opinion, the war had already been won (sounds like 2003?). Anyhow, who needed those “boxes with coils inside,” his moniker for radar. It was manly courage that decided wars.

Göring then issued an order, in his capacity as president of the *Reichsforschungsrat* (Reich Research Council), for all young Germans with a background in electronics to volunteer for special radar training to catch up with the Allies. I, together with some 400 other 17-year olds, followed the call and reported for duty at the camp “Prinz Eugen” in the *Westerwald* on Saturday, 23 October 1943. In the next 6 months, we learned all about Maxwell’s laws, German radars and radar receivers (preferred on U-boats), and Allied radars as far as known. (After the war I could still converse with American radar experts about

the details of some of their “secret” radars, for example that the American high- μ tube 6AC7 was replaced by the similar German tube EF14.)

I once measured the wavelength, λ , of our fire-control radar with a makeshift *Lecher* setup and was immediately reprimanded for “exposing” one of the *Luftwaffe*’s top secrets. This was a ridiculous charge because the Allies knew perfectly well that λ was about 50 cm—as evidenced by their tinfoil strips tuned to the “secret” wavelength.

Early during the *Westerwald* I met Jobst von Behr who became a lifelong friend. We were both interested in mathematics (and still exchange problems 64 years later) and despised military discipline. I remember chatting with Jobst during a roll call. We were standing in the back row oblivious to the goings on around us when his name was called by *Oberscharführer* Snita. Snita had to call my friend three times (Behr, von Behr, Herr von Behr) before Jobst responded with a meek “here.” Whereupon the *Oberscharführer* launched into one of his favorite tirades about these “gentlemen” who won’t respond until addressed with all their titles. Jobst had to step up to the front, fall down on his hands and do pushups.

Snita was also partial to wine. I remember, when we had to help him with the “tasting,” we became somewhat “tipsy.” In the subsequent class (*Deutsch*, if I recall correctly) my head was swaying. The teacher (Dr. Sieg) must have noticed this and he asked me something about our current reading (Hermann Löns: *Wanderer zwischen den Welten*). Being hardly able to speak, let alone give an intelligent answer, I replied in a slow voice: “*Das möchte ich gerne noch einmal lesen.*” (“I would like to read the book again.”) Just the right answer! The teacher was duly impressed.

After the *Westerwald* my next military assignments were with the Navy: first boot camp and then the Radar School on the Baltic island of Fehmarn and the Radar Observation Station in St. Peter-Ording on the North Sea. The German air force wanted to get rid of me (because I had missed boot camp as a result of a foot injury contracted by stepping on a glass shard on my last outing to a local lake with my parents and sisters before being drafted). As it happened, I had also missed the *navy* boot camp so on the day of inspection I was used as a *target* for hand grenade throwing exercises. I had to climb into a fox hole while everybody was throwing live practice grenades at me. One hit the earth wall behind me and rolled into my fox hole. I was practically sitting on the sizzling thing and jumped out as quickly as I could. Everybody, the admiral included, exploded in laughter: “This is just what the enemy wants you to do. You would be mowed down by machine gun fire by now!” I didn’t care. All I knew was that I was still in one piece and a potential father.

In Fehmarn we learned about German counter measures against the tinfoil strips (“chaff”) which had blinded the German radars ever since the attacks on Hamburg in July 1943. The new German radars exploited the Doppler effect to distinguish between slow moving strips and fast airplanes.

We also learned about the special radar problems for submarines. To preserve “radio silence,” they would only use “passive” radar, i.e. radar *receivers*. This was a good idea until it was discovered that the French-made *Metox* receiver (named after

its inventor Metox Grandin) had a little wire smuggled into its circuitry that connected the local oscillator with the U-boat's search antenna. This was communicated by French resistance to the Allies which thereupon could switch off their own radars and just listen to the radiation from the German sub. This was a double blow to the subs: they were no longer forewarned by the approaching radar of Allied planes and had their own position unwittingly betrayed.¹

Another trick, invented by the American physicist Luis Alvarez (later of dinosaur-extinction fame), exploited the relation between distance and radar intensity: The inverse square law that governs gravitation also describes the falloff of radar power with distance. This simple fact was exploited by German submarines during World War II. By measuring the increase in radar intensity, they could gauge the rate of approach of an enemy plane and dive undersea for safety before the plane could attack.

This tactic worked very well for Grand Admiral Karl Dönitz until Alvarez had a foxy vision, code-named *Vixen*. Alvarez suggested reducing the radar power so that it would be proportional to the *third* power of the range to the submarine. Thus, while the plane was approaching, the power incident on the unsuspecting U-boat was actually *decreasing*, giving the false impression that the radar plane was flying *away*. A grand idea indeed! (For the attacking plane, however, the received radar power reflected from the boat would still increase as it closed in.)

One *German* radar invention were the highly directive dielectric finger antennas mounted on a revolving turntable under a kind of plexiglass cheese bell. These antennas fed the U-boat's radar receiver but had the bad habit of breaking off in an Atlantic storm. Then a sailor discovered that the best way to repair (and protect) these fingers were condoms. Henceforth all German submarine crews had to carry an extra supply of condoms as a regulation wartime outfit.

At the end of the war, I found myself with coastal radar in Holland, huge installations that could pick up a plane over distant London once it was 200 m above ground. The Dutch navy officers, who had missed radar while in hiding during the war, were impressed and wanted us to repair them for their use in coastal shipping. But the Allies insisted on our dismantling them being afraid (in the summer of 1945) that the Soviet Army might advance to the coast opposite Britain and use them against their former allies.

Once we had a visit of some ten higher-up Dutch officers (we counted a total of 32 golden sleeve rings) and a dispute developed as to the distance of a target, a fishing trawler: our (freshly calibrated) radar showed 7 km, but one of the older officers, a former ship's captain, insisted that it was only 3 km. Neither side would

¹ According to other sources, the *Metox* saga was planted by the Allies to divert attention from the real reason for the increased U-boat losses, namely, the introduction, in March 1943, of a new (10-cm) search radar (H2S) which *Metox* couldn't detect.—The *Metox* was superseded by, among other radar receivers, the *Naxos* and the *Naxos ZM*, with an antenna which rotated at 1,300 rpm and with which I had a personal encounter in January 1945.

give in until one of the Dutch officers reminded the captain that he was looking at the sea from a high dune (Noordwijk aan Zee) rather than from a shipboard and what looked to him as only 3 km away could well be 5 km or more.

Toward the end of the war, we were planning to escape from Holland to neutral territory (Spain, Portugal?) by commandeering, if need be by force of arms, the launch of the Harbor Master of IJmuiden. To be able to leave the port, we had to make some telephone calls to have the anti-submarine barriers (chains) lowered. It worked!—The chains were, in fact, removed. But someone in the Harbor Authority must have become suspicious and, upon double-checking, was able to expose our ruse and the chains went up again. End of dream of a free post-war “cruise”—a potentially very dangerous situation (the port exit channel was also protected by two medium-caliber cannons).

Of course, everybody was happy that the war was over. The only reason we youngsters were sorry that Germany had actually lost the war was our fear that there wouldn't be any more nice German *Tanzmusik* on the radio. But it didn't take us long to discover that the Allies were broadcasting even nicer jazz ballads and swing music. I remember how we fell in love with “Don't fence me in,” “Sentimental Journey,” “American Patrol” and many other then very popular tunes. In the same building as ours, with walls adjacent to our living room, some elderly officers were quartered. They congratulated us on how well-behaved we were—except, occasionally, all hell seemed to break loose in our quarters. Why? Did we tell them about the American jazz that drove us crazy? Maybe. After all, the war was over and it was no longer forbidden to listen to foreign radio stations. (But we certainly didn't tell the gentlemen from next door that one of us—a navy lieutenant, no less, in his nightshirt—actually jumped on top of a wardrobe and crowed like a rooster.)

Another circumstance that lightened our burden of having lost the war was that we were sitting on endless supplies of molasses (in oil barrels!). We soon discovered how to ferment the stuff, distil it and collect it in a beaker, drop by precious drop. Needless to say, the “distilled” nights—brewing was of course illegal, so we couldn't do it during the day—were among our happiest. And what we couldn't consume on the spot, we brought to a boil, poured it over ground coffee and produced the best *Kaffee-Liquör* I have ever tasted.

We also had beautiful carpets in our “camp” quarters. One day, after a new set of guards had taken over, one of their sergeants requisitioned one of our gorgeous “groundcovers” for himself. When he came back an hour later, wondering why we hadn't delivered the carpet as ordered, the “object of his desire” had disappeared. (We were hiding it in the attic.) And the sergeant, taking a very belligerent pose, proclaimed “*Als het tapijt niet onmiddelijk ter voorschijn komt, werd u gearresteerd!*” (If the carpet doesn't reappear immediately, you will be arrested!) I was just standing there smiling. (I liked to hear Dutch.) Whereupon the sergeant turned in my direction: “*En u ook!*” (And you too (will be arrested)!)—The *En u ook* later became a standing expression in my family.

17.1 Outside the Geneva Conventions

Incidentally, at the end of the hostilities in May 1945, we were classified as “capitulated personnel”—outside the Geneva Conventions.² But in our case, in Holland, it meant Canadian army rations and even home leave, which allowed me to ascertain that my parents and sisters had survived the war unhurt and our house in heavily-bombed Hamm was still standing.

Indeed, as I approached our house, after having traversed plains of rubble, I didn’t dare ring the door bell. Who would answer? Were my parents still alive and had they managed to flee from distant Silesia? So I walked around the house and saw, through a basement window, a large store of apples that maybe only my mother could have scrounged up in those desperate days. I finally entered the house through a back door into the kitchen. And I didn’t have to ask who was still alive. They were all there in that one room: my parents, my sisters and even my grandmother. I was so overjoyed, I started crying. But the rest of my family, while certainly glad to see me return from the war hale and healthy, didn’t seem as emotional as I. Why? They had just received a postcard that I was on my way home.

The Canadians to whom we had capitulated were boys about our age (18–20 years) and they commiserated with us that, as radar people, we had never really fired a weapon. So they returned our machine guns (and even a bazooka!) to us for one afternoon so we could have our little private war in the dunes (with tracer ammunition and the rest). (This exercise in silliness, incidentally, was not without its dangers. I remember one bazooka going off right in front of us. Nobody was hurt but all of us were blackened like chimney sweeps.)

Understandably, the higher-up brass were not amused when they got wind of the happenings.

Since we were sitting on plenty of now useless ammunition, the lure of making our own rockets was always close. And, indeed, some of our contraptions, made from wooden sticks (broomsticks) and sheet metal (from army ration tins), flew 100 ft high in the air. The only bad thing about it was that we actually *ate* some of the spaghetti-like ammo: it was sweet and tasty. But too much gave you a headache. How silly can you get?

In April 1947 I was repatriated from Holland where I had remained voluntarily since the end of the war. Originally, they had picked six older guys who didn’t know much about the inner workings of radar and who were eager to be reunited with their wives and children. But three of us, all below twenty, wanted to stay in Holland and our “petition” was granted. The six older men were of course jubilant and so were we. (We were afraid of the makeshift PoW camps on the banks of the Rhine, where many unfortunate prisoners perished as a result of hunger and poor

² At the end of the war, General Eisenhower suddenly found himself with some three million German captives on his hands and he felt he couldn’t possibly treat them all under the Geneva Conventions. So they were placed outside the Conventions.

sanitary conditions entailing typhoid and other epidemics.) Best of all, as already mentioned, we were treated by the Allies as “capitulated personnel” outside the Geneva Conventions. I know it sounds unreal after 9/11 and Guantánamo but we enjoyed many benefits including excellent food, good accommodations, and even vacations (home leaves). And of course the work was interesting: being able to demonstrate to the Dutch naval officers who had stayed in Holland during the war how radar worked. In fact, they wanted to keep some of our radars intact to monitor coastal traffic. But, as already pointed out, the British were unrelenting: all radars had to be dismantled.

After the Canadians left, a company of Nederlandse Stoottroepen (Dutch Assault Troops) became our guardians. I befriended corporal Pieter Broeks with whom (as a “prisoner”!) I travelled to Haarlem and other places. In Haarlem I became close friends with Nico Bartels who owned the radio repair shop “*De Onderduiker*” (The Underground Diver). He taught me (and gave a living example of) democracy and friendship between nations. During the war he had been a member of the Dutch underground (called *onderduiker*). This was also the time I started to study *Nederlands* (Dutch).—I visited both Pieter and Nico and their families after I was released from my Ersatz-Guantánamo on 15 April 1947.

Our next guardians were from the Palestine Regiment of the British Army. We were probably among the few Germans inside barbed wire with the Jews on the outside. We had a very fair relationship, all in English—until the last day when the Jewish sergeant-major concluded the daily roll call with some words of appreciation in perfect German.—Once, when a wristwatch of one of my buddies was stolen, captain Neumann (originally from Berlin) had his troops lined up so that the German prisoner could identify the thief (who was duly disciplined). A fine example of fairness of victor toward the vanquished! Or as Churchill wrote in 1948 in his *The Second World War* (Moral of the Work. Vol. I, *the Gathering of the Storm*):

In War: Resolution. In Defeat: Defiance.

In Victory: *Magnanimity*. In Peace: Good Will.

Once the radar job was completed, we were assigned to ordnance dumping duty in the North Sea—a dangerous job because the guards liked to shoot at the (punctured) ammunition canisters before they sank and sometimes there was an explosion and one or a few prisoners were killed.

My main job, though, for which I had volunteered, was to build an electrocardiograph for the Dutch Navy which I felt I could do (“slam dunk”). But to my shame, I must admit that I never got the contraption to work properly—there was always too much noise (and hum) and the EKG records were hard to read. (Now I would use tubes heated by d.c., as opposed to a.c., for the heaters in the preamplifiers.)

Buying the proper cameras for recording the EKG required some travel to different parts of Holland and pretty soon, prisoner Schroeder travelled *solo* without accompanying guards. Once, on a “private” trip through Holland, I opened the door

to a railway compartment full of our camp guards. I quickly slammed the door shut before anybody could recognize me.

On another occasion I shared the compartment with several ladies who were wondering why the train wouldn't leave the station. "Had the train schedule changed?" I felt my Dutch was already so good that I could join their conversation and said: "Mij zijn helemaal geen wijzingen van de dienstregelingen bekend" (I haven't heard of any changes in the schedule). Whereupon they looked at me in great astonishment. Had they recognized my "Prins-Bernhard" accent or were they only surprised by my butting in? I never knew, but I kept my mouth shut from then on.

Another illegal activity indulged in by many camp mates was smuggling. I remember once hiding, under my greatcoat, a medium-size munitions box with ground coffee and scented soap (in the same box!) for my family in Germany. As soon as I had passed the camp guards, I panicked and started running whereupon one of the strings that held the box snapped and the box fell down. But it was caught at the last moment by a second string which almost strangled me because it went around my neck.

On my last day in camp I put all my belongings into my *Seesack* (sea bag) and had it taken to our home-bound vessel by an ambulance which some buddies were using to smuggle pots and pans and other goods that were scarce in Germany. They pretended that the patient in the ambulance was highly contagious—a ruse that worked. But when I came to the inspection point our captors were wondering why I had so few belongings. They immediately smelled a rat, arrested me on the spot and confined me to a small cell. What especially raised their suspicion were my mysterious sketches and calculations of multivibrator circuits that I had kept with me in my briefcase: they were convinced they had caught a spy. (Later these calculations came in handy when I was designing pulse generators to test early TV sets at *Grundig Radio*.)

The happenings during the next 10 min were almost beyond belief: I told one of the Dutch prison guards, whom I had befriended a bit before, to please run to the ship and warn my buddies of the impending disaster. I can still see the guard sprinting past the suspicious inspectors on their way to the boat for a thorough check. Thanks to my friend nothing was found and I was released (without apologies).

In May 1947, I was discharged from the German navy, receiving one pair of long johns and a very nice blanket for my services to the Third Reich. (The Nazis had of course promised everyone a farm in Kazakhstan, but I was never very fond of farming anyhow and the blanket came in very handy: my mother had it dyed a fashionable dark blue and turned it into a pretty overcoat for my older sister.)