Sample chapter from
Adventures of a Star Warrior
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COUNTDOWN

1972

The night belonged to the Titan and the Chaser. We owned the Pacific Missile Range that night—two launch pads and two blockhouses brightly lit and active in the immense darkness along the California coast. As Program Manager for Project Chaser, I was at the Vandenberg Range Operations Center, a building on top of a small hill facing west over launch complexes to the ocean.

"Test Conductor, this is Mission Director," I said into the microphone of my headset.

"Go ahead, Mission Director," I heard Russ Steeves say in return from the launch console in our blockhouse.

"I'm in Building 488 now, Russ, through the count. I haven't seen Letson or Russell yet. Any change since I was there?"

"No, we are still holding at T minus 240 minutes, waiting for the Titan to pick up the count. The launch window opening is still 0300."

"Okay, thanks. I'll check up on things around here and be listening over the net."

"I copy," Russ said, completing our exchange.

"2230, arrived at 488" I jotted down in my logbook for 10 October 1972. I unloaded some folders from my briefcase and placed them on my desk in preparation for a long night of waiting. The Vandenberg Range Operations Center was very familiar to me now, after being here for many countdowns in Project Chaser. I sat again at my desk console, with switches, a headset, a video monitor, and telephone

handy in a large amphitheater full of similar consoles. Most will remain unoccupied tonight. On the surrounding walls are video displays, clocks, and recorders, many with colored status lights or red digital displays. The time clocks are moving forward, the countdown clocks are moving second by second toward zero.

Could this be the last night? The final countdown of our project? It could well be, for we were funded for only four Aerobee rocket flights, and number four was on the pad. I was now a rocket scientist, with three flights under my belt. For ten years, I was a laboratory scientist, building a research team and having some successes. Then I volunteered us for this project. Now here I was almost three years later, a Program Manager on a space project. In my early forties, I was nobody's ideal leader of men. I was slightly under average height and a bit overweight. My trim brown hair was parted neatly on the side, and my blue eyes were behind glasses for nearsightedness. But my group and I had the expertise in ultraviolet research needed for this project, so here we were.

I had no time for further reflection. For the moment I had to monitor anything that might be an imminent problem for my project. I took off the headset with its earphones and microphone and headed up the stairs toward the glass-enclosed rooms above and behind the amphitheater of consoles. I was looking for Bill Letson, our Range Program Manager here at Vandenberg, who always knew how things were going. I found him down a little hall in the Range Status room. Bill was ten years older than I with a ruddy complexion and average height. His physique suggested that he spent more time in bars than gyms. He was dressed as always on launch nights in a suit and tie, as was I. I followed his lead in dress, because it reflected the no-nonsense attitude needed on countdown nights. Bill and I were both career civil servants, and civilian employees of the Air Force. Bill had a bit of the Sergeant Bilko character about him, being able to beg, borrow, barter, or steal what was needed at the moment for his projects. I felt lucky to have him on mine.

"Hello, Bob," Bill said, "Say, this just might be the night for you guys. You've had your share of troubles, but I have a good feeling about tonight."

"Hope you are right. We are all getting a little uptight after the two unsuccessful countdowns last week. We've been out here too long. How does it all look tonight?"

"Well, the Coast Guard's Venturous is ready as usual, in position about one hundred miles off the coast. Their weather is excellent, with ten miles visibility and a one-foot to two-foot chop. Good prospects for recovery. Our chartered fishing boat, The Pacific Clipper is out there also, at the near side of the expected impact zone.

"There is no problem with the railroad, although there is a lettuce train on a siding at Sudden that has to leave right after the window closes in the morning. The trawlers that always mysteriously show up on launch night seem to have moved to their usual position out of the danger zone. We have go-ahead for most of the window from observation by foreign recon satellites.

"All our radar and telemetry remote receiving stations are up and running. See there on the wall, they are all showing green on the status board. Our aircraft is ready to be launched when we get closer to the launch time."

"Good to hear, Bill," I said.

At the Range Operations Center, it was possible to understand what a vast array of resources was made available to our little Project Chaser. Tonight, the range belonged to us and to our Titan II target missile. Up and down the Pacific coast, at Kwajalein atoll thousands of miles from us where the Titan would land its payload, on ships at sea and aircraft in the air, people stood ready. Radar and communications stations had their antennae locked on us. Tracking optical telescopes were warmed up and ready to record. Ground and flight safety teams were standing by if needed.

I was constantly fascinated by the Pacific Missile Range. Here, the Atlas, the Titan, and the Minuteman Intercontinental Ballistic Missiles, or ICBMs, had all been tested before deployment. Here, improvements to them were still tested, and launch crews from silos all over the country came to learn how to launch their weapons. All this equipment and all these people were ours this night.

"Have you seen Jim Russell?" I asked. Jim was a Lieutenant Colonel in the Air Force, whose primary job was running our laboratory's field office on Vandenberg. He would probably be checking to see that the target missile office remembered us. Project Chaser was a small operation on a big missile range, and we could be overlooked.

"Not for a while," Bill replied, "I'll tell him that you are looking for him."

I went back to my console and waited, with the headset on to catch any news that might come along. This was the hard part, just waiting. Stress and tension were a part of it. You never knew what was going to happen and what you, as Program Manager, would be called upon to decide.

Actually, I was usually not alone. This night, some officers from our AF Space Division sponsors and associated Aerospace staff scientists were there. Between research scientists like me and operational people there is always a bit of friction. But we had each gained some respect for each other during the project. I was recognized now as the principal person to make hard decisions about the launch, if hard decisions had to be made.

For a launch to happen, we had to go through a countdown. We had, in fact, two countdowns to worry about. We were launching our small Aerobee slightly after an ICBM and then chasing it as far as we could downrange, while measuring the brightness of the exhaust plume from the missile's engines. So our countdown had to follow the count of our target missile. We would stop our countdown, or hold the count, if our target missile had to hold their count for a problem that might crop up. We would start our count again when the target started their count. Our team of engineers and technicians in the blockhouse had to have our rocket ready to launch when the target launched. Our countdown was orchestrated by our Test Conductor, Russ, in accordance with our countdown plan.

I came back to the problems of this night. I picked up my telephone and called Duane Paulsen in the Titan launch blockhouse. Dr. Duane Paulsen was in my group from the lab.

"Hello, Duane," I said, "What is the mood there? Why are they holding the count?"

"Oh, it is nothing. They are planning to launch tonight if at all possible. They just discovered a battery that had not been replaced according to their procedures, so they have to send a guy up there to change it. Routine glitch, it seems to me. We have to keep ready." Duane answered.

Duane being in the Titan blockhouse was our secret weapon to know what was going on with our target missile. Program offices, like people, did not like to admit to problems, and even when they held the count, it was impossible to know if the reason were major or trivial unless you had your person to talk to in their blockhouse. Duane let me know that the current problem was trivial. I thanked him and hung up. I then relayed Duane's message to Russ Steeves in our blockhouse. Our count was still on hold, waiting for the Titan to pick up their count.

"Russ, I just talked to Duane in the Titan blockhouse. The hold problem is trivial, something about a battery that has to be replaced. You ought to stand by, for they still plan to launch tonight." I said.

"Fine, we are standing by here." he answered.

I continued waiting at the console. Jim Russell called in and had no problems for us. He would be here for the launch. I passed the time with the two Flight Safety Officers, a captain and a major, who had the job of cutting down stray missiles before they could do any damage. They are like umpires or referees, with life or death power over your missile. You wanted to treat them with respect. I decided it was too early to start on the coffee and snacks from the machine down the hall. The coffee was terrible anyway.

About an hour later, at 2345, the Voice boomed out deeply and authoritatively from loudspeakers everywhere on the missile range:

"Attention all stations. Operation XXXX will resume its countdown at T minus 240 minutes. The launch time is 0345."

I knew the operations number of the Titan launch, and this was it. We had to pick up the count on Project Chaser. Soon, I heard Russ's voice on the Chaser net. Our count was picked up at T minus 200 minutes.

Over my headset, I monitored our countdown. It was methodical, calm, and professional. All parts of the Aerobee, from the rocket hardware to the scientific instrumentation to the water recovery package were tested. All had to work together soon in their brief trip to the upper atmosphere and back.

I listened in on the count casually, not needing to get into the details. I heard things like this:

"Payload Coordinator, this is Test Conductor."

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"Go ahead, Test Conductor."

"Begin Item 35, test of on-board telemetry with internal battery power."

"Roger."

Then there was silence as the work proceeded using the electronic test equipment in the blockhouse.

"Test Conductor, this is Payload Coordinator."

"Go ahead, Payload Coordinator."

"Item 35 is complete, telemetry signal is strong. Voltage of the internal batteries is xx, which is within the spec."

"I copy. All stations, Item 35 is complete and should be so noted. The Project Chaser count is now at T minus 180 minutes. We are slightly ahead of schedule. We will begin Item 36 in about five minutes."

I leaned back in my padded office chair at the console and continued to wait. Countdowns fascinated me. The "three, two, one, liftoff" moment always sent a chill up my spine. They were really only a logical way to organize complicated and dangerous tasks that had to be done in a certain order. Some engineers said that developing a countdown plan was really just doing your thinking in advance.

Historians trace the introduction of the countdown into rocketry to one of the first science fiction movies, *Frau im Mond*—The Woman in the Moon—a German film released in 1929 by the famous director Fritz Lang. A part of the publicity for the film was to be the launch of a small rocket by Hermann Oberth and his team, which failed to happen. The dramatic device of counting down the seconds to launch, however, was soon adopted by German rocket developers, including the young Wernher von Braun. There has always been an element of show business in the world of rockets and space.

Earlier science fiction writers missed the opportunity to use a countdown. Jules Verne counts up to forty seconds to fire. H.G. Wells does something similar in his book about men on the moon. The American scientist Robert Goddard apparently did not use countdowns. But after World War II, everybody seems to have adopted the German method.

I like countdowns because they begin our journey to the space frontier. They are the hurdle we must cross, and even today a rocket can "blow up on the pad." Getting ready for the launch is slow and demanding. When the count reaches zero, something good or bad will happen fast. No science has been done at liftoff. Without a successful launch, no science will be done.

It was 0045, and the Voice from the range operations loudspeaker spoke again.

"Attention all stations. The liftoff time for Operation XXXX is now 0350, rather than 0345."

I heard Chaser adjusting to this slight change.

At 0100, the Chaser countdown net announced that our final telemetry check was okay. We learned what happened in space through radio transmission from our payload to ground receiving stations; this is called telemetry. At 0115, Bill Letson came by my console with the latest weather report from the Venturous. "They are reporting that the sea remains very calm and recovery ought to be no problem. Their helicopter is ready. I also had a word with Frank LeBlanc. He is in good spirits and ready to develop the Nikon camera film on the ship." Frank was another person in my research group. He was on the ship to oversee the ocean recovery of our payload and develop film from the Nikon camera in the payload immediately in the ship's darkroom. These pictures would be an independent way to show that we had the target in our field of view when we measured its brightness.

I went back to waiting and talking with my visitors. I was not able to read anything much. I just stared at the countdown clock, the digits relentlessly and slowly moving down toward zero. I decided it was time for coffee and a bag of chips, so I went back to the food room down the hall from the consoles. It was brightly lit, in contrast to the dim lighting at the consoles. The room had coin-operated food and drink dispensers around the walls, and tables and chairs in the center. Some sleepy technician was heating a bowl of canned beef stew in the microwave. All the food here was from the machines, and it was not exciting.

I was not too hungry. On launch nights I always ate a big Mexican meal with enchiladas, refried beans, Spanish rice, lots of corn chips, spicy salsa, and much iced tea. I wondered if I was doing this to ensure good luck from some mythical Gods of the Countdowns. Nah, I thought, I was a scientist. I was beyond superstition. Still, I did eat the big Mexican every launch night. And I also found myself visiting the old Spanish Mission in Lompoc a lot. I didn't actually pray for success, but the presence of a higher power was comforting.

Anything could happen when the count reached zero. The whole rocket could even blow up on the pad, rapidly ending your project. There are no atheists in blockhouses, the space-age foxhole. One Sunday in church back in Massachusetts, I was casually browsing through the book of Proverbs in the pew Bible, when some words seemed to leap out and grab me. I have placed them at the front of this book, as they sum up what I did as a rocket scientist. "The horse is made ready for the day of battle," I read. These people were preparing their advanced military technology, the war horse, for a battle. We were doing something similar as we prepared our rocket and its payload for the space frontier. The verse concludes "…but the victory belongs to the Lord." That is the way I have found things to be.

Enough deep thoughts, I told myself. I put a lid on my coffee, grabbed my chips, and walked rapidly back to the console. At 0230, the liquid nitrogen container was refilled on Chaser. The infrared sensors had to be cooled to make their measurements, but the coolant container, called a Dewar, had to be small. The hold time for the coolant was only about two hours, so there had to be refills during the countdown, which turned out to be a real pain in the neck. Maybe this fill would last us through the count.

Many people spent a lot of time waiting in the Range Operations Center for the countdown clocks to get to zero. There was a combination of stress and boredom in the air. The large room was kept as dimly lit as a casino, to better see the large red digital clocks giving time or countdown time and the many video displays giving a roving glimpse of launch complex and missile. Somebody decided that large posters of outdoor scenery would help relieve some of the stress. Mountains, seashores, forests, foliage, clouds, lakes, filled all the space not allotted to equipment of some kind. When I felt tense, I looked at these posters. My favorite was a shot of the Big Sur coast, with waves crashing against picturesquely eroded headlands jutting out into the Pacific. The coast by the Chaser blockhouse looked something like this. I sometimes wished I was there, not here.

At 0305, the Voice said, "Operation XXXX is at T minus 45 minutes and counting." Letson came by to tell me that our two ships and a backup search aircraft were where they ought to be. He affirmed again that all the remote radar tracking stations and telemetry recording stations were showing green on the status boards. We were in good shape.

At 0320, I heard Russ giving the order to top-off the liquid nitrogen coolant in the Chaser payload for the last time. When the igniter was armed, as it soon would be, it was too dangerous to service the payload, so this fill would have to last through the flight. Getting close now.

At T minus thirty minutes, the usual ritual of the recorders began in front of the amphitheater of consoles. From a side door, two technicians in white coats bearing the name of the contractor supplying this service emerged and began to check out the flight safety recorders. They had spray bottles of solvent and boxes of Kimwipes. The four-foot by eight-foot high pen and ink recorders had to work perfectly, to track the ICBM as it headed downrange within its assigned flight corridor. The technicians worked swiftly and silently, wiping the metal rods upon which the recorder pens slid back and forth with solvent and tissue so they operated smoothly, checking on the ink supply, seeing that the pens were not clogged, and positioning them at the launch site on the large maps that the pens will mark on. The ritual continued until all ten of the massive recorders were serviced, then the white-coated technicians disappeared behind the side door. The flight safety display was ready.

These big recorders intrigued me. They were really just like the strip-chart recorders we had learned to use as students in the laboratory. But they were much bigger and made to operate in two dimensions, both back and forth and up and down the vertical display chart. These days, there would be no pens with ink, but some sort of plasma video display based on digital technology. But this was 1972, and many of us still carried slide rules along with the new pocket calculators. Nobody knew about laptop computers or cell phones. Yet, we somehow made it to the moon and back many times in those years.

At 0345, the Voice announced: "Operation XXXX is holding their count at T minus five minutes. The count will be picked up at 0356 for a 0401 launch"

I didn't like the sound of this. It could be big trouble. Over my headset I heard Russ orchestrating the work on our operation to accommodate this last minute change. Okay, not to worry yet. Five minutes is a long time in a countdown.

Then, at 0355 the Range Operations Voice said, "Operation XXXX is on an indefinite hold. The count will not be picked up at 0356."

Suddenly, I felt very worried. Not picking up the count? Why? I heard on our net Russ making adjustments on the Chaser pad. I grabbed the phone and dialed Duane.

"What's going on?" I loudly asked.

"I'm not sure about all of it. We are ready to go, but apparently a down-range tracking station required for the mission has just gone from green to yellow. Nobody knows why, but they are trying to find out what is going on. There are options and one is to try to get approval to waive this required support. Some general someplace will have to okay this. There is actually a good bit of yelling going on in here now that I ought to hear. I will get back to you." Duane reported.

Now we really began to sweat. Minutes went by. Why doesn't the Voice tell us something? Planes, ships, and missiles were ready for the operation. Everything but some receiving station someplace. We wait.

The Voice was silent for twenty minutes.

At 0415 the Voice spoke again: "Operation XXXX is still holding at T minus five minutes. It is estimated that the count will be picked up at 0425."

Duane called: "Believe it or not, they did get approval to waive the down-range station. It is only a required sensor, not a mandatory one, so the General can waive it with good cause. They are going to launch." I passed this information on to Russ over the telephone. I said that I would keep the telephone line open now, for our usual backup communications during the launch. If something wild happened during the Titan launch, I would notify Russ privately and quickly, and our launch might be able to be stopped.

Bill Letson came by my console. “I never thought they could get approval for this. Never seen it done, to drop a required item of the launch criteria. But it is only required, not mandatory. It is really only a backup. General Stanley doesn’t do anything without my buddy Jack, his tech rep, okaying it. We have always thought this station was not really needed. This is the third countdown for this Titan, as you know, so I guess they decided they had to go on without it. I know this is what Jack recommended to Stanley, and this time he must have agreed. So, General Stanley dropped the handkerchief. For you, it means that you are in luck. Get ready, they’re going.” He left quickly to get back to the Range Status room before the launch.

At 0425, the Voice boomed out: “Stand by all stations for the launch of Operation XXXX. The count is at T minus five minutes and counting. The count will be marked by this station beginning at T minus thirty seconds. Again, all stations, stand by for the launch of Operation XXXX.”

If they could, people all over the range who heard this announcement would stop what they were doing and look toward the ocean. Life seemed to pause and wait for the launch. Everything seemed more exciting, more real. I heard in the background on the Chaser net that the telemetry and data looked good. I took deep breaths and stared at the Titan video monitor.

The Voice spoke: “Thirty seconds....twenty seconds....ten seconds....five, four, three, two, one, liftoff, we have liftoff of Operation XXXX.”

A cloud of smoke and flame surrounded the launch tower on the video display as the giant Titan II missile slowly and majestically left the pad, as liquid fueled missiles do.

The Voice quickly announced: “Stand by for the launch of Operation XXXY. The count is at T minus sixty seconds and counting.”

This was us. The video displays now showed our pad and our little Aerobee 170 rocket. The Titan liftoff switch had triggered an automatic sequencer on the Chaser firing circuit, and we would be launched automatically sixty seconds after the Titan.

My eyes were also watching the ten large recorder screens, which sprang to life at the launch of the Titan. The pens were racing across the maps, tracing a line inside the well-marked safe flight corridors.

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We had a good bird. The Flight Safety officers were just sitting there motionless. There was nothing for me to tell our blockhouse, so I quickly looked back at the video display of the Chaser pad.

The Voice spoke, "Thirty seconds....twenty seconds....ten seconds.... five, four, three, two, one, liftoff, we have liftoff on Operation XXXY." The Chaser video screen filled instantly with smoke and flame. Chaser was on its way to space.

"Hot damn," "Go, baby," "Yeah ha," "Damn, look at that" I heard in my earphones over the countdown net. The tension and stress were broken, as network discipline was forgotten briefly. We all took a few seconds to say so long to Chaser in our own ways. The Lord had given our carefully prepared rocket a launch. Would we also have a victory?

Suddenly, I did not have a lot to do. It was all automatic from now on. The switches had to switch cleanly and on time, our sensors had to work as planned, the parachute had to deploy, and many other mechanisms had to operate as they were designed to do.

As I listened on my headset, our Chaser countdown net became active and professional again. I heard that our booster has reentered safely, that calibrations inside the payload were under way, that the nose cover was opening to allow our sensors to see the target, that the roll sequence was proceeding as planned. I heard some telemetry guy telling Russ excitedly that we were in "fat city," meaning that there was a lot of signal being recorded.

It was all over in five minutes. Russ announced that the nose was closed and sealed, that the payload and the spent Aerobee rocket had separated, and then that the payload was on the parachute headed for a soft landing in the Pacific. What I heard couldn't have been better, but we had not seen any measurement data yet, I reminded myself. We could still wind up with little or no useful data if even one of a hundred things went wrong. But I would deal with all this later. Our electronics technician Vic Baisley had seen the telemetry come in at the NASA receiving station, and it looked good to him. I valued his opinion.

Right now, I needed to drive back to the blockhouse as soon as possible and wait for more news.

"Test Conductor, this is Mission Director," I said into the headset.

"This is Test Conductor, go ahead."

"Congratulations all around, Russ. I'm leaving the Range Operations Center now, and will drive back to the blockhouse."

"I copy."

I took off my headset and packed my briefcase. Letson came in all smiles. He warmly shook my hand.

"I told you that I had a feeling about tonight! How do things look?"

"Too early to tell, but I'm heading for the blockhouse and will let you know later," I said as I walked toward the door. I resisted the opportunity to be too optimistic until I had seen some of the data records.

"Hang on a minute. Have something for you," he said as he handed me two sheets of paper. "These are the official range liftoff times of the Titan and the Chaser. You need to keep these for your records. You guys are going wild now, but don't forget to get all your records. Stick these in your briefcase so you won't lose them."

"Okay, and thanks, Bill, for everything. See you at our launch party?" I asked.

"You can count on it, Bob."

I took a quick look around the Range Operations Center. This place had been my home on many a countdown night over the past year and a half, and now, in what I suspected was my last night here as a Mission Director, I was sorry to leave it. I nodded goodbye to Jim Russell, standing across the room and left. Enough nostalgia for now.

Driving to the blockhouse, along Surf Road with the black Pacific on the right of me, there was no hint of the approaching dawn. Damn, I felt good. I forgot sleep, and coffee, and food. I was on a high. We had pulled it off! The countdown and launch worked as they were supposed to work, finally. We had been granted what looked like a victory.

All I saw was a bright future. I intended to continue to do space experiments if at all possible. I liked my new career as a rocket scientist. I liked to win! I had found my frontier in cold-war rocket science.