

CHAPTER 1

Bottle Rockets and Business Deals

1944: Age 5

I liked to blow things up, I guess. Actually, I liked explosive reactions. That sounds more politically correct and less like I am reading from a terrorist handbook. As a young child I was free to run loose in my neighborhood in Harvey, Illinois to find my own adventures. One of my favorite things to do was sit still, listen and use my imagination. I loved to sit on my front porch and listen to the Illinois Central Railroad switchyards. The clanging and the shoving of cars mixed with the jostling of the tracks and whooshing of steam erupting from pressure relief valves on the train engines kept me fascinated for hours at a time.

My friend Eddie Davidson lived right next door and he introduced me to rockets. Since he was several years older than I, he knew about such things and loved to show me what he could do. He was about fifteen years old and I was probably five years old when I started going next door to his house to check out his antics and adventures. Eddie was a patient guy and didn't mind that I was so much younger. Maybe watching Eddie was my first attempt at surrounding myself with people who were smarter and had more answers than I did.

Eddie was a licensed HAM radio operator. He had built his own shortwave radio transmitter and receiver. He had it set up in his bedroom and let me come upstairs and listen in. I would sit real quietly and listen to Eddie's conversations with people all over the world. I hoped to build my own unit when I grew up.

One day I watched Eddie emerge from his house and head toward the alley with an armload of strange supplies. It looked like he was going to cook up a recipe or something because it looked like he had raided his mother's kitchen. I jumped up and followed him.

"Eddie! Eddie what are you doing with your mom's stuff?" I asked.

"What?" He stopped and spun around. He was carrying a glass Coca-Cola bottle and what looked like ingredients for a cake. Eddie had short dark hair and intense blue eyes. He was a skinny kid with dirty fingernails and the required boyhood scrapes and scratches along his freckly arms. He wasn't wearing any shoes and I could see his dirty feet were planted in the dry, wispy grass in his backyard.

"Whatcha going to do?" I tried again. Sometimes Eddie was secretive, maybe he just wanted to keep me interested in his adventures. Once or twice he told me was training to be a spy and would probably be sent to Germany. The year was 1944, so he had me living on the edge with his stories of soldiers and undercover missions.

"I'm going to practice exploding things. That's what I'm going to do. Are you volunteering to be blown up? I could use the practice before they send me to fight the Nazis," he said, carefully scanning me, up and down. Was he wondering how much cake ingredients he needed to blow me up?

"No. I'll just watch," I told him.

“Ya sure?” he asked, giving me one more chance to be blown up.

“I’m sure. I have to be home by supper.”

“Just watch then, but don’t tell anyone. This is top secret, Ray.” He looked at me with his best undercover spy scowl, drawing one eyebrow down and glancing around the alley to make sure no one was there.

Eddie placed the glass Coca-Cola bottle in the middle of the gravel alley, right behind our garage. I hoped my dad wouldn’t be home until we were done blowing things up and I also hoped the blown up things wouldn’t include his garage. When Eddie was sure the bottle wouldn’t tip over, he placed a plastic funnel into the bottle and poured white powder from a yellow cardboard box into it until the bottom was covered with a pile two inches high. He carefully wiped off the powder that spilled down the outside of the bottle with his grubby, dirt-smearred hands, and looked at me.

“The white explosive powder is bicarbonate of soda. If you spill some you have to wipe it up or you’ll blow up too much stuff. When I add vinegar it will explode, so get back, Ray,” he instructed me, waving the funnel in the air for emphasis.

I backed up to the edge of the gravel and he picked up a glass bottle filled with a clear liquid. He waved his hand impatiently, motioning to me that I should back up even more so I ended up on the grass in our backyard. I thought I was too far away to see anything and started to feel restless. He wasn’t a spy. Anyone knew that.

Eddie put the funnel back into the bottle and stood up. He crouched down next to the bottle, but kept his right leg sticking straight out to give him a quick getaway. For a moment he struggled with keeping the funnel in place and lifting the large glass vinegar bottle to the lip of the funnel. He splashed vinegar into the funnel and all over his blue jeans. Eddie scooted backwards and fell, gravel grinding into his palms as his bare feet scraped for purchase so he could escape.

The acid and vinegar combined in a violent reaction, releasing carbon dioxide at a rapid rate. A whooshing blast of gas and vinegar came shooting out of the top of the bottle, which tipped over, shooting vinegar and gas right at Eddie. His jeans and white t-shirt were covered in foamy vinegar sludge and he lay there, squeezing his eyes shut against the blast.

“Whoa! Eddie!” I shouted. “What happened?”

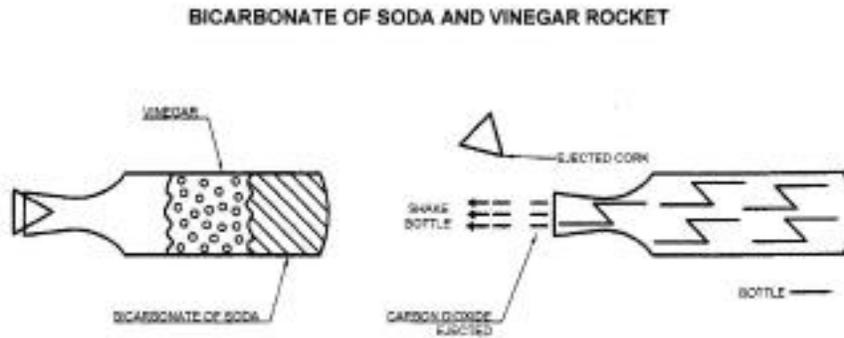
“Ah, Ray,” he said, “ya know rockets don’t always shoot off the right way. That’s why I gotta practice this some more.” Eddie wiped his eyes with the back of his hand and squinted at me.

“Okay, Eddie,” I said. “Next time it will probably work.”

Eddie’s spy explosion reminded me of the sounds of the nearby switchyards. The chemical reaction produced the same whooshing sound as the steam engines. I decided to try this experiment on my own. I asked my mother if I could borrow the same ingredients Eddie had used and she agreed. As a matter of fact, Mother and Dad never resisted when I asked to do my experiments. They just sort of humored me and kept providing me with a little bit of vinegar and every once in a while a box of bicarbonate of soda. Everything was just fine as long as I kept myself busy without blowing up the garage and just asked for a few common kitchen items from time to time.

I must have gone through several boxes of bicarbonate of soda and a couple bottles of vinegar in my spare time just doing this chemical reaction over and over again. Sometimes I’d let it shoot up in the air and sometimes I’d put the Coca-Cola bottle on the sidewalk on its

side and let it shoot down the sidewalk like a little jet-powered car. Eddie went on to other spying adventures and pretty much left me alone to blow things up. As far as I know he wasn't sent to Germany.



Rocket design I used when I was five years old

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1969: Age 30

Twenty-five years later I was sitting on the edge of the bed holding my hands over my face. It felt like my head was going to blow up. My customary airplane migraine had accompanied me from Milwaukee to Buffalo, New York the night before and I could barely function by the time I reached the Tonawanda Holiday Inn. Before attempting to sleep, I popped two APC tablets and hoped to be rid of the headache by morning.

Sleep escaped me and the headache persisted, pounding away the hours until I was unaware of anything but the pain. It was worse than the night before. When the phone rang I squinted at the bedside clock. It read 11:30 a. m. I was supposed to be in the business office of Galaxy Manufacturing Company at 9:00 to check on the progress of the rework on the alternate rocket nozzle insert. It had to be remade due to faulty welding we hadn't noticed before shipment to Milwaukee the previous August.

I answered the phone, wondering if it was Don Magro, the machine shop manager

calling to see if I was still alive and planning to show up as promised.

“Hello.”

“Good morning, Ray.” It was Dick Keller, one of my two my business partners at our company, Reaction Dynamics. He was calling from Milwaukee.

“I called Galaxy and they suggested I try the motel,” he said.

As soon as I heard the tone of Dick’s voice I knew there was a problem. I knew him well.

“What’s up?” I asked, hoping it wouldn’t be too bad.

“We need to make a decision,” said Dick.

“What kind of decision?” I asked.

“Pete and I were called down to The Institute of Gas Technology yesterday to meet with the project sponsor’s reps. We were told that the American Gas Association is requiring us to sign over the ownership of the Flame to IGT or they’ll cut off further funding for the project,” Dick explained in a rush.

“What the hell for?” I barked.

The Blue Flame land speed record car we were building was sponsored by the American Gas Association (AGA), a massive consortium of companies selling and distributing methane, commonly known as natural gas. The Institute of Gas Technology (IGT) in Chicago was the research and development arm of AGA. IGT also handled the sale and distribution of industry hardware such as valves, piping and storage tanks. IGT was overseeing the land speed record project for AGA, although the sponsorship contract gave full control of the car’s development to our company, Reaction Dynamics.

“Well, they think we’re mishandling the project and they have concerns that we’re over budget and behind schedule. They believe it is time they took control,” he said.

“What did you and Pete say to them?” I demanded.

“We told them we wanted to discuss it with you before we made a final decision,” said Dick.

“The car is ours, Dick.” I told him, wincing.

The pain was getting even worse. I was feeling nauseated and light-headed, maybe from the sickening thought of signing away The Blue Flame and any future business prospects for our new company. If we were successful at setting the world land speed record the sponsor would be allowed six months to exhibit and promote The Blue Flame. However, our company retained full ownership.

“I know. Pete knows. We told them we wanted to talk to you first.”

“Did you try to negotiate a compromise or change their minds?” I asked him, my voice hoarse and urgent.

“Pete and I think we should do what they want so they don’t drop us altogether. It would be better to get a chance to set the record doing it their way than not doing it at all,” he said quietly.

“Dick! The American Gas Association is not going to drop us. They can’t just forget about the project at this point! They have too much money in it now.” I was incredulous he was talking this way.

He didn’t respond.

“We are almost done,” I continued. “The rocket engine is built and ready for testing. They’re just bluffing, hoping to get the record *and* the car by threatening us with cancellation. You can’t believe they would pull out now!”

Silence stretched from Milwaukee to Tonawanda. Would Dick and Pete really cave in

to IGT? The future of Reaction Dynamics depended on the company retaining ownership of The Blue Flame. Maybe this phone call was just a formality and they had already signed over the car. If two signed and one didn't, majority would rule in this corporation of three.

"Don't do anything until I get back. I have to be here until Galaxy finishes the insert on Friday and I'll fly back that night," I told Dick.

"Okay. We'll wait until next week to settle this," he said.

We exchanged terse goodbyes. I hung up the phone with sweaty hands. Perspiration broke out all over my body in prickly protests to my conversation with Dick. My migraine had just rocketed from bad to severe. I hoped some fresh air would help. I grabbed a glass from the bathroom counter, filled it with water and snatched three more APC tablets from the plastic pill bottle on the cheap laminate nightstand. I gulped down the tablets. As I walked out the motel room door and into the parking lot I could still taste the flat tap water, rusty and obstinate as iron city pipes.

The motel was located in a commercial district of Tonawanda. There were no trees, just a bleak landscape of small commercial buildings, a couple of gas stations and a lone McDonald's restaurant about a half block down the street. All of the buildings were a shade of dirty gray, brown and black. The scene was hardly one to help relieve a troubled body and mind.

Still, I knew at that moment that I would not sign my name to a new deal that would ensure the demise of my company. We were in business for ourselves. There was no way I would deliberately put Reaction Dynamics out of business after only one and a half years of effort. The Flame project was our big opportunity to get a business reputation as a high tech company with space age skills. If we became only a footnote in The Blue Flame story as builders of the car, our opportunity would be lost. After the speed record was set, only the Flame's driver and IGT would get any publicity if we left it up to IGT to publicize the role of Reaction Dynamics in the land speed record.

Worried, I gazed blankly at the McDonald's yellow arches. My stomach was churning at the likelihood that Pete and Dick had already made up their minds. A worn out Chevy Bel Air, gray with neglect and red with rust, turned into the parking lot of the restaurant with a raspy rattle as its rear end scraped along the concrete. That bumper and I had both seen better days.

FROM CHAPTER 9

Drag Strip and Bright Idea

1963

“Did you say drag race?” I asked, looking at Dick Keller. He was approaching me in the hallway of the Chemistry Research Building at the IITRI where we both worked.

“Sure I did. So have you ever been to a drag race?” Dick smiled, eyebrows raised.

“No, I’m not interested in racing,” I answered.

“Well, I’m going up to Great Lakes Dragaway in Union Grove next weekend. It’s up near Milwaukee. Do you want to go with me? I mean, what else do you have going on?” Dick said.

“Nothing, I guess.”

Phyllis and I spent most weekends at our apartment or socializing with Dick and his wife Nancy on the IITRI campus since they lived right down the hall. I didn’t know it then, but this conversation with Dick was the beginning of the story of the Blue Flame journey.

“I don’t even know what a drag strip is!” I admitted as we rode the elevator down to the cafeteria.

I knew that guys with hot souped-up cars often got together at night on some deserted road and had side-by-side races to see who had the fastest car. I also knew that occasionally these encounters proved deadly to the drivers or their passengers who were almost always the girls they were trying to impress.

“Now it’s a sport. I guess there are still unsanctioned drag races, but that’s for stupid teenagers. I’m talking about the real racing machines,” Dick grinned.

He informed me that there were privately-owned drag strips like Great Lakes Dragaway where guys could pay an entrance fee and compete with others on a quarter-mile asphalt strip with timing devices to accurately measure their elapsed time and speed. There were official national records kept for various automobile types.

“That’s a good idea to get that kind of activity off the public streets,” I answered, wondering what I was getting myself into.

“There are also cash prizes and trophies given out for the quickest cars at some of the major events every year. In fact, some guys are drag racing full time.”

“You mean that’s their job?” I asked.

“Oh, yeah. They appear at tracks in almost every state. The very best get sponsors and everything,” Dick said as the elevator doors pinged open. We headed toward the cafeteria. I didn’t know what to say or how to get out of this.

“Well, then do you want to ride up with me on Saturday? They’ll have the exhibition cars and all the engine roar you can take in one day.”

I really had no interest in going, so I had to justify going for some other reason. In my mind, I figured that since Nancy was our babysitter during the day when Phyllis was teaching school, I should be nice to Dick and try to be a good neighbor.

“Okay, I’ll ride up there with you just to see it,” I shrugged, “but I really have no interest in cars or auto racing.”

“Me, too, I’m just a spectator,” said Dick.

“So, is Nancy going? Should I ask Phyllis to get a babysitter?” I asked.

“Nah. It would be just us. If we leave right after dinner we can catch the evening races. You’ll like it.” Dick assured me.

Since we got stuck in drive-time traffic, we didn’t arrive at the drag strip until the first events got under way at seven that evening. During the drive up it became apparent that maybe the only reason I was asked on this trip was that Dick wanted to show off his new Pontiac GTO. He obviously had more interest in fast cars than he let on during our initial conversation about this trip, since we made the trip mostly in excess of the posted speed limits.

Dick purchased a pit pass in addition to the normal spectator admittance ticket.

“We need to get into the pits so we can see the action and talk to the drivers,” he said.

The first thing I noticed about drag racing was the sound. Everything was loud. Noise assaulted me from every direction: engines revving, crew members shouting, fans squealing, music blaring and the excited chatter of the announcer as each car was prepped for the starting line. As we walked through the pits looking at the cars and the pit crews, engines were being “tweaked” for optimum performance.

“All the drivers tweak their cars even if they don’t need it. It’s part of the fun,” Dick said.

Crews would always arrive at the strip well ahead of race time to play with the cars and their engines. “Rails,” a type of Top Fuel car, burned a special type of fuel called nitromethane. “Nitro” was an expensive chemical, which was also used as a rocket propellant. In a properly altered Chrysler “Hemi-head” V-8 engine, this fuel could increase the engine horsepower.

“Do the nitro engines explode a lot? Seems kind of dangerous.” I was wondering just how safe the pit area was.

“Sure they do. Sometimes.”

I nodded and quickened my step as we continued our tour of the pits. The thunder of the engines as they were revved up was deafening. The ground actually shook. I wished I had brought along a pair of the ear protectors we used at the lab when working in the machine shop. During tweaking, huge blue flames shot out of the exhaust manifold on each of the eight cylinders of the engine. Dick explained that all Top Fuel owners used Chrysler engines exclusively, since they had the largest cylinders. Each of the stock engine cylinders were then bored-out to create even more room for burning the nitro, thus producing even more horsepower.

Another aspect of drag racing that caught my attention was that each crew seemed to have a “Honey,” sometimes more than one. A Honey was a wife or girlfriend who seemed to be dressed in a manner to attract maximum attention from bystanders or members of the racing fraternity. These women were usually dressed in short-shorts and tight-fitting t-shirts with the racing team logo on the front and back as well as some phrase with sexual connotations in appropriate locations. In short, their job was to keep everyone happy that they had attended, even if the job of tweaking had become boring. Honeys were always very friendly and in many cases knew as much about drag racing as their “associates” (boyfriends). In some cases the women were the car owners and drivers. In those cases they had male Honeys.

It crossed my mind that this might be my last tour of the pits. It seemed like a place I only needed to see once.

We took our seats in the grandstands to watch the racing. As I watched the brightly painted cars hurtling down the quarter-mile strip trailing a white plume of smoke from burning rubber tires, I thought of my home-made rockets streaking into the blue sky with a thrilling roar and trail of white smoke. In both events large quantities of power were being released followed by a vehicle streaking away into the distance.

I was surprised to see so many people at the races. There must have been close to a thousand at this event. Most were young, but about a quarter were middle-aged. About half were female. Most race crews seemed to have a following in the ranks of the spectators. After races involving the more famous drivers, the winner would return to the pit area via a side road parallel to the strip. The winner would sit on top of the car waving to the cheering crowd while being towed back in front of the grandstands, by the pit crew. The loser usually didn't get much attention when he passed by.

I liked what I saw. I was most impressed with the cars that made the most noise and smoke. But as we sat there, I asked myself if I would make the effort to come again on my own.

"Let's get going!" Dick shouted before the last race started.

"What?" I couldn't hear him over the roar of the engines blasting their power into the stratosphere.

"It gets pretty hairy if we wait to leave with everyone else," Dick told me.

After watching hours of racing, most spectators left the track pretending that they were drag racing heroes driving Top Fuel rails and shooting down the strip in their family cars. Driving out of the drag strip could be hazardous to your health, especially since most of the spectators had been drinking for several hours.

On our way back to Chicago, Dick looked at me and asked, "So did you like it?"

"Sure, sure. I probably won't go back, but I appreciate your invitation and it was entertaining!" I assured him. I was impressed by the sound of the top-fuel engines as they revved up for a run. I thought of the steam engines in the rail yards in Harvey as they released the steam in their boilers.

I also thought about the similarities between rockets and drag racers. Both had the possibility to produce raw power, shock and awe. Was it possible to create a hybrid of the two?

Just after we crossed the state line into Illinois, I told Dick, "If I were to build a drag car, it would be rocket-powered."

He didn't say anything right away, but then asked, "Why rocket-powered?"

"Rockets have the highest power to weight ratio of any moving vehicle. We spent all night watching guys trying to pack as much power as possible into their drag cars to achieve as much acceleration as possible down the strip. Seems to me that most of the power was used in burning up their tires from the friction of the rubber on the asphalt road."

"How is that different with a rocket?" he asked.

"A rocket would not use wheels to push the car forward. All the rocket power could be used to drive the car down the strip."

We sat in silence for a while and I mulled it over some more.

"Another advantage of the rocket," I said, "would be to eliminate the problem of keeping

the car going straight when one of the two driving wheels is driving harder than the other one. Several drivers had lost control of their cars during the race and had run off the strip tonight. Luck played a part in their not killing themselves or someone in the grandstands.”

“There is a class of drag cars called jet cars,” Dick said, “they use surplus military jet engines as their power plant.”

“How come we didn’t see any of those?” I asked. “A jet couldn’t beat a rocket, but that would be interesting to see.”

“There’s not many running, since the weight of the engines turns the car into a very heavy dragster,” said Dick. “Most drag strips are too short to allow for the car’s parachutes, so the car can easily run off the end of the drag strip and crash. Some of those guys aren’t around anymore. They ended up either dead or seriously crippled.”

“A rocket engine would be less massive than any of the car engines we saw running tonight and would have more power.” I said. “It would also not need to be tweaked. Plus a rocket is a lot less expensive and has zero maintenance compared to the continual adjustments required to maintain an automotive engine. You wouldn’t have expensive parts to replace after every run—no exploding engines at \$4,000 a crack!”

Dick shrugged and kept driving, not too impressed. Maybe the absence of tweaking would be a negative to most gearheads, but not to me, since I had no interest in pistons, valves and superchargers...or acquiring another Honey.

We did not say much for the remainder of the ride back home to Carman Hall, our apartment building on the IITRI campus. I spent the rest of the trip thinking about the advantages of a rocket car vs. a jet-powered car for the ultimate drag racing machine. The rocket would produce twice the power-to-weight ratio than a jet-powered car. The rocket motor would have less maintenance. The rocket-powered dragster would have no tire wear due to tire slippage.

The hydrogen peroxide rocket dragster would also be safer to operate and less dangerous to the spectators than the automotive engines, which frequently explode when the crews used nitromethane fuel. Overall, I decided the rocket-powered dragster would be safer, less expensive and produce more power than either the automotive engine or jet engine. Finally, the rocket machine would be a novelty and draw more interest than the jet-powered cars which were already well known to drag racing fans.

It was close to midnight when I walked in the door of our apartment. Phyllis was sleeping. As I crawled into bed she asked how it went.

“It was ok,” I told her.

I thought that was the end of it.

CHAPTER 10

Baptism by Rocket Fuel

1963

The next week, Dick came in the lab at IITRI and he said he had thought about my comments about the rocket-powered dragster. “What do you know about rockets, and if someone did want to build a rocket-powered dragster what kind of rocket do you suggest they use?”

“Well you’d have to use something that was controllable.” I said. “You don’t want to just bolt on some solid-propellant rockets that are basically like sky rockets, where you ignited a fuse and the vehicle went out of control until the rocket engines burned out. You need something where you could control the thrust of the engine.”

“Is that even possible?”

“You could design it where either you turn it on or shut it off when you wanted to. You know, modify the thrust during the run. That way you’d have the same amount of control over the power that the people with auto engines do.”

“What kind of fuel would make that happen?” Dick asked.

I thought for a second. “It would require a liquid-propellant rocket.”

“Well what would be our options if we wanted to do that?”

“The only one I know of that I would consider safe enough to use at a public place like a drag race would be hydrogen peroxide. You would have hundreds or thousands of people lining the raceway. You wouldn’t want your car to explode and shower them with red-hot high velocity shrapnel or gas them with toxic exhaust!”

Dick nodded and said, “True. That would be bad...”

I chuckled. “You need a very safe liquid propellant. Hydrogen peroxide is the way to go.”

Dick was intrigued by our conversation and didn’t say much more about it until sometime later that week. Again he brought the subject up and said, “I would be interested in possibly building a drag race car using a hydrogen peroxide rocket. Would you consider sketching up a design of a rocket engine that I could look at?”

“Well, I don’t know. I’ll try.”

So at some point I went back to my George P. Sutton book, which I had used to design my earlier rockets with Dale Carpenter. I used Sutton’s equations to design a small 25 pound thrust rocket engine which would of course be way too small for a race car. But since I had never built one of these before the thing to do would be to build a very small scale engine and test it to see whether we could get it to work. If it did work, we could scale it up to a much bigger size and use it for our drag racing engine.

Fortunately I had been working at IITRI for a while and part of my duties were to go to the chemistry building’s machine shop from time to time and fabricate various types of metal parts. The parts were for electrodes used in high temperature molten-carbonate fuel cells to be used in U.S. Navy fighter planes. Sometimes our experiments required us to make

prototype experimental models so I had some experience in using a metal turning lathe, band saws and various grinding tools. I was well equipped to make this engine. It was just a matter of finding the material and going into the machine shop after hours to make it.

All the materials I needed were in the shop. Across the hall from the Chemistry building machine shop there was a room with a scrap bin where scientists tossed their leftover stainless steel rods and remnants from lab trials. I pulled out a few stainless steel rods and got to work.

"If I'm successful in making this miniature engine," I said to myself, "then maybe we could see about trying to find some 90% hydrogen peroxide to use for fuel. We'd also have to find some type of silver mesh to use as a catalyst and to decompose the hydrogen peroxide into steam and oxygen."

It took me several days to finish my rocket engine, and in the meantime Dick had been searching the chemical supply houses to see who sold 90% hydrogen peroxide in small quantities. He had come up with a source called FMC Corporation in Buffalo where we could buy one pint bottles of 90% hydrogen peroxide at an affordable price.

We bought one pint. We found a company that sold pure silver wire cloth, so we decided to buy a little bit of that for our experiment.

Before long I had assembled the rocket engine. We had the fuel. Now the question was how did we test it?

I talked to Phyllis about the rocket project one night after work. Cheryl was sleeping on a blanket on the living room floor while Phyllis and I sat down to a dinner of chicken and dumplings. I poured myself a glass of milk and a glass of beer for Phyllis. She scooped steaming dumplings, dripping with gravy, onto my plate. She fished around in the pot for a few large chunks of white meat for me and plopped them down as well. She served herself, looked up and smiled.

"So what *are* those drawings you left on the coffee table? Are you working some overtime hours this week?" she asked.

"Actually they are just something I'm working on with Dick." I said. "We might build a rocket-powered dragster. I don't know. Dick is pretty interested in racing and he asked me to build a prototype to see if it would fire."

Phyllis took a sip of beer and shrugged. "What do you mean a rocket-powered dragster? What's that all about?"

"Well, when we went up to Union Grove we saw all these dragsters and I mentioned to Dick that a rocket-powered car could outrun them all!"

"Oh. Huh. I didn't get the impression you were all that impressed with the races. Do you plan on racing it around here?" Phyllis glanced at Cheryl, who had started to roll towards the living room couch. She was chewing on the edges of her pink and white blanket. It looked like she might roll herself up like a little pink and white burrito.

"I'm not sure where this is going." I said. "Dick and I are just going to see if I can make a miniature rocket in the shop and if it fires without blowing up maybe we will keep going and build a bigger rocket for a car."

"I remember you liked rockets. Didn't you and Dale almost blow up the south side of Chicago one night fooling around with rockets?" Phyllis laughed and scooped another bite of chicken and gravy into her mouth. I could see she was just giving me a hard time.

"Well, this time I will find a better testing spot with no witnesses." I said.

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Dick and I still hadn't agreed on building a rocket-powered dragster. I think maybe Dick had decided in his own mind, but to me it was just an experiment. We were going to build a rocket engine and test it. The possibility of actually building a car using this as a power plant was sort of remote to me because I wasn't that interested in racing and Dick, at this point, was approaching this very casually. He didn't really press that issue with me.

We decided we had to find a place to test this rocket engine. "I know some drag racers that live out in Blue Island." said Dick. "They said we can use the vacant lot across the alley from their garage. The neighbors shouldn't complain too much about the noise because they're used to loud engines and people working on cars. No one will call the police or anything—they're so used to the drag cars they will think we're another set of dragsters."

It turned out the vacant lot in the Chicago suburb was in a residential / commercial area, so it didn't appear as though the neighbor problem was going to be too big. It was nice because the actual lot itself was recessed maybe six or seven feet right along the alley, sort of like an embankment. So we thought we could put our rocket engine in the vacant lot on the embankment area and be out of the line of fire, so to speak, if the engine were to blow up or something.

We set about trying to design some kind of a test device. We had to get the engine to fire, and at the same time measure the thrust to see if my calculations were correct on the nozzle design, which would create 25 pounds of thrust. In addition we needed to find out if we used enough silver catalyst or if we needed to enhance the silver mesh to improve reactivity.

Our first engine was very small -- about 1 ½" in diameter and about three inches long. I think we put in enough silver mesh to have a catalyst pack that was maybe an inch in diameter and ½" in depth. I had no way of knowing if that was enough or not. For all I knew you might need a catalyst pack that was an inch in diameter and 12 inches long or 24 inches long. I had no idea, but since silver was very expensive I decided we'd start out with the assumption that it didn't take very much.

The engine, high pressure fuel tank, fuel lines and valves were all made of stainless steel. The hydrogen peroxide needed to be contained in stainless steel or pure aluminum otherwise it would start to decompose all by itself in the container. We added a bottle of compressed nitrogen to attach to the fuel tank to force the hydrogen peroxide out of the tank and into the rocket engine. Dick and I had to save money, so we borrowed a high pressure tank of air, a small stainless steel container to put the hydrogen peroxide in and a valve from our labs to add to the rocket motor and complete our design.

The trick was going to be figuring out how much hydrogen peroxide to run into the engine in order to get the proper 25 pounds of thrust. In other words, we had to put in so many gallons per minute. We couldn't just push in an unlimited amount. In order to get the right amount of thrust not only did I have to design the nozzle just right, I had to have the flow of the fuel through the catalyst pack at a uniform and proper rate in gallons per minute. I calculated the chamber pressure of the rocket needed to be 300 pounds per square inch.

I decided we would use a needle valve to control the flow of the hydrogen peroxide into the engine. To prepare for our experiment we did some preliminary work in the lab at ITRI.

We pre-calibrated our rocket using water at 300 psi tank pressure in the system because we couldn't afford to run hydrogen peroxide through every time.

When I decided we had all these things figured out and we had designed a thrust stand that would measure the thrust at the same time, we were ready to test the engine. It was a warm summer morning in 1964 when Dick and I packed up our equipment and drove out to the vacant lot in Blue Island, Illinois.

We decided to mount the rocket engine pointing downwards. What is normally the bottom or back of the rocket engine would point upwards. This would cause the engine thrust to push the tiny engine downwards on the top of a bathroom scale. The amount of force would be displayed on the scale as pounds of thrust generated. We could eyeball how much push the engine had during its operation by looking at the scale.

Dick was in charge of reading the scale during the rocket test, so he stood along the embankment above the alley about 30 feet away from our test stand. He gripped his binoculars tightly and watched me assemble the test stand. Dick had also mounted an 8mm movie camera near the test stand so we would have secondary data in case he couldn't actually see the reading through the binoculars. If the engine did blow up then at least it would just hurt the camera, but maybe not do damage to Dick.

I double checked the equipment and made sure the angle was good for the rocket to thrust directly against the scale. I ran the fuel line up the embankment and to the bottle of compressed air in the alley. I stood on the embankment, out of harm's way. The rocket engine and test stand were mounted almost directly below me with the nozzle pointing up. I was just about to give the signal to Dick that we were ready to fire.

At that moment Dick got up.

"I'm going to go down in the lot. I can't see the scale from here," he said. So he went down to the vacant lot and got close enough to the rocket engine so he could see it through his binoculars.

Now we were all set to go. I opened the needle valve to the proper point. The hydrogen peroxide rushed out of the storage tank, down the fuel line into the engine. It proceeded right through the engine and shot up into the air in a nice stream.

So as soon as I saw what going on, which only took a fraction of a second, I immediately shut the valve to stop the flow of hydrogen peroxide that had just shot right through the catalyst back without decomposing and out the rocket nozzle and into the air.

Much to my surprise I felt this liquid splashing down on my head. I was in exactly the right spot for this stream of peroxide to come back down and land right on me. I sort of panicked at this point because I knew that hydrogen peroxide was such a strong oxidizing agent that it could very easily start my hair on fire.

"No! Damn it!" I shouted and quickly turned around to look for help.

Luckily, there was a garden hose across the alley in the backyard of the nearest house. I ran over to the hose, turned it on and doused my head, trying to dilute the hydrogen peroxide.

Dick came running up. He was peering through the binoculars at the scale and by the time he figured out something had gone wrong I was spraying water all over myself.

"Ray! Ray! What the hell are you doing?" he screamed at me.

"Did you see the spray? Did you? The hydrogen peroxide came gushing out and sprayed all over me! I had to spray it down or else start on fire!" I answered. I squeezed my eyes shut tight and kept waving the hose.

“No! No, I didn’t see it. Holy cow, Ray. That is crazy. Is it over? Are you going to start on fire?” asked Dick, stunned.

“Okay, okay. No. I’m fine.” I said. “Maybe the ratio of hair to hydrogen peroxide wasn’t enough to ignite.”

I stood there, relieved and soaking wet from head to foot.

Giving up was not an option because we had done so much planning and experimenting with the rocket system in the lab. We decided that the problem was due to the catalyst. There just wasn’t enough catalyst in there to do the job. There was still some peroxide left, so we decided to try again.

“Let’s not put the full amount of HP in all at once this time,” I suggested. “Maybe we should just sort of dribble it in, you know, open the valve just a little bit on a second try. I’m thinking maybe the decomposition will happen if it were allowed to percolate for a few seconds before we shoot the full amount in.”

“You mean preheat the catalyst and get some steam first?” said Dick.

“Yeah, then we can open the valve all the way and fire it once it gets hot enough.” I said.

This whole thing was not all that well conceived, but we were more interested in getting the experiment done than in safety. Sometimes you just have to take a chance and see where it leads.

Dick grabbed his binoculars and assumed his position. “Go ahead.” He nodded.

This time I just cracked open the valve a tiny bit and waited. There was sort of a gurgling sound and all of a sudden a big cloud of steam started pouring out of the rocket nozzle. It wasn’t jetting out, it was just billowing out of the nozzle. I thought it must be pretty hot by now, so I opened the fuel valve to the proper position and Bingo! Instead of a jet of hydrogen peroxide we heard a loud exhaust sound from a high velocity jet of steam and oxygen shooting out the nozzle. It lasted for a good ten seconds. Then the rocket shut off automatically, the fuel spent.

“Yes! Yes! That’s it! It worked!” Dick ran up the embankment and slapped me on the back.

“It worked! The noise is the key. The scream of the rocket means it worked!” I was thrilled.

We were out of hydrogen peroxide and the question remained: did the engine generate any thrust, and if so how much? Dick had gotten so excited from the noise of the rocket he missed getting a visual reading. Maybe he had been a little frightened at the noise and lost his focus. Fortunately the camera was running. The only way we were going to know for sure if we had hit the 25 pound mark was to get the film developed.



Testing our 25 lb thrust rocket engine in the Blue Island alley

We picked up our stuff, packed the car and headed back to Chicago. After a minute or two we looked at each other and started to laugh out loud.

“You and the hose, Ray. You and that hose. Classic. Ha! Good thing you have quick reflexes!”

I chuckled. It was pretty humorous in retrospect. But at the time it happened I was sure I was going to lose my hair.

We took the film in to be developed and picked it up a few days later. Sure enough, the camera did pick up the dial on the bathroom scale. The dial shot immediately to 25 lbs. As soon as the fuel was exhausted the scale dropped back to zero again.

The test was a success.

Dick and I had a pretty good feeling that we knew enough about rocket engine design to go ahead and scale the engine up to a bigger size -- if we wanted to -- for powering a drag racing car.

FROM CHAPTER 22

Moving On and Salt Flat Struggles

1970

I never went to the Bonneville Salt Flats to see The Blue Flame attempt to break the land speed record. I stayed in Wisconsin and looked for a new job. I had to put The Blue Flame behind me. My dream of owning my own business had failed and would have to wait until I was able to rebuild my goals and dreams. I needed to find a new focus.

After I left Reaction Dynamics, Inc., I tried to design a small rocket for use in schools to demonstrate the principles of rocket propulsion in a high school physics laboratory setting. The system would use 50% hydrogen peroxide as the propellant. I worked with Dr. Carl Uzgiris from IITRI to find new venture capital to finance the company, but we did not find the financial backing we needed. Phyllis tried to be patient, but after a while a certain amount of panic set in and we had several tense conversations about the status of my employment.

One February afternoon just before lunch I walked into the kitchen of our ranch home in Germantown, Wisconsin. I had been in the basement all morning working on some drawings for my high school rocket lab idea. Our home was bright and warm, thanks to Phyllis's attention to decorating details. Our kitchen had several windows, which were full of late winter sunshine and cozy yellow curtains she had ordered from Montgomery Wards. The room smelled of hazelnut coffee and snickerdoodle sugar cookies.

Phyllis was rummaging in the refrigerator. She stood up with an armload of bologna, cheese, lettuce and mustard before shutting the door with a swing of her hips.

"Ray, are you done in the basement?" she said.

"Yes, for now. What do we have for lunch?"

Phyllis ignored my question. "What are you working on downstairs?"

"I'm drafting some ideas Carl and I have for the new company," I said. "We need to have examples of designs to show when we meet with possible investors."

"Is Carl paying you to do this?" Phyllis asked. Her voice was getting a little higher and louder. She snatched a loaf of Wonder Bread from the bread drawer next to the sink and twirled its plastic bag to get it open.

I glanced at the kitchen table and watched our daughters playing for a few moments. They were oblivious, thankfully. Cheryl was hunched over the Etch a Sketch applying the finishing touches to her wobbly drawing of a cat's face. The whiskers on the left were much longer than those on the right, giving the cat a drunken and lopsided look. Cathy was folding the tabs of a mink hat over her paper doll's well-coiffed hair.

We didn't argue in front of our kids.

"No. No, he's not paying me. After lunch I'll look in the paper again and see if there are any new job openings."

Phyllis gave me a small smile. "Oh. Good. That's good. Do you want lettuce on your sandwich?"

We subscribed to the Milwaukee Journal and in those days the help-wanted section was full of jobs. It wasn't too difficult to find openings for research technicians. Each day I searched through the ads and circled the jobs that matched my qualifications. It was depressing because the jobs were entry level and not very high tech. They were just jobs, not dreams. I was going from "way up here where I wanted to be" at Reaction Dynamics to "way down here where I used to be" at Illinois Institute of Technology. I felt very discouraged that I had to start over.

The Blue Flame crew was finishing the car without me, and I felt that I needed to put that situation "in the closet," so to speak. I told myself that what had happened with Reaction Dynamics was a business decision; nothing more and nothing less. IGT had laid their cards on the table and forced a decision for the three officers of our small company. Pete and Dick took one option and I simply took the other. I didn't shed any tears or spiral into the depths of depression over the loss of the car or our company. It was what it was.

I managed to keep my regret and frustration in check for 30 years. But eventually that closet door burst open and I fell apart over my unfulfilled dream.

v v v

Throughout the late summer and early fall of 1970 I was anxious about the rocket motor. I was working as a research technician for Ewing Engineering in Milwaukee and actually liked my job. Initially it seemed like it would be entry-level and kind of repetitive, but as the months went on I realized the company was more interested in research and development than I thought. I was happily surprised to be assigned challenging projects and work with interesting people. But every day I would sit at my desk and listen to the radio, half expecting to hear that The Blue Flame rocket car had exploded at a drag strip near Union Grove, Wisconsin. I was worried that people from Reaction Dynamics or IGT would be killed.

We used Great Lakes Dragaway in 1966 to test the X-1 rocket engine by chaining the X-1 to a telephone pole on the drag strip and running the rocket engine without letting the car move forward. I suspected that this would be the only engine test the Blue Flame rocket engine would get because that was the only type of test Dick or Pete had witnessed in the past. The Blue Flame rocket needed much more than a telephone pole and amateur observers.

In September 1970, as I settled into my professional life at Ewing Engineering, Reaction Dynamics and crew drove across the country with the intent of setting the world record in a matter of days. The Blue Flame was perched proudly on a long and sturdy trailer as the Reaction Dynamics truck towed it toward Utah. The Bonneville Salt Flats are located just outside of Wendover, Utah, about 100 miles due west of Salt Lake City. The local Holiday Inn announced "Welcome Blue Flame Crew" on their roadside marquee.

It took the crew and Gary five weeks to set the record, with only hours to spare before the 1970 racing season was over. The car and the team were plagued with problems both minor and major during their weeks on the salt. The major road block was the rocket motor. It wasn't cooperating.

If you are relying on a rocket to get you a record, it is not the wisest thing to lose your rocket specialist. The rest of the crew did not know how to install let alone operate the rocket system. There were two people who understood and could have implemented the rocket propulsion correctly: Jim McCormick and me.

According to Pete, the crew initially attempted to fix the car right on the salt flats, but after a while they realized they had to try something else. The crew brought the car back to Wendover Field in town and set up shop in one of the hangars. They tried to get to the bottom of the engine problems and make enough adjustments in order to set the record.

My relatives in California sent me news clippings of the events in Utah, and the press in Milwaukee covered the story of The Blue Flame every few days, so I received frequent updates. There were reporters camped out at the salt flats and each morning they would ask the crew if today was the day Gary would break the record. I don't know how many of the news stories came from critical mistakes made by the crew, actual mechanical failures, bad luck, or bored reporters cooking up stories. It is also possible that the crew or sponsor embellished the stories for the reporters in order to divert attention from the fact that they didn't know how to make the rocket motor operate properly.

I collected the headlines:

"Parachute Stop Faulty; Flame's Trial Marred"

"Blue Flame Fails Again in Record Bid"

"No Brakes at 500 m.p.h.! Pilot Slides to Stop in Seven Miles"

"Blue Flame Gets Repairs"

"Lazy Blue Flame Still Misses Mark"

"Blue Flame's Chute Fails at 555 m.p.h."

"Flame Attempt Thwarted by Wind"

"Speed Bid Postponed"

"Blue Flame Repaired For Try At World Land Speed Record"

"Flame Hits 620, but Misses Record"

Why was The Blue Flame not setting the record? What was the trouble with the car? Among other things, the Los Angeles Times reported, "A malfunction in the catalyst pack that facilitates the burning of liquefied natural gas and hydrogen peroxide in the motor of The Blue Flame Rocket Car." In another articles The Times detailed the "wild ride" Gary Gabelich endured when a fire damaged the cords holding the car's parachutes in place. When Gary tried to stop, there were no chutes. The Blue Flame was traveling over 550 mph at the time, so the slide took seven miles! The car ended up stuck in the salt, and it took hours for the crew to pull the car from the quicksand-like muddy bog. Gary joked afterward, "The Flame was covered with salt when it stopped. You'd have thought we were being sponsored by Morton the way it looked."

The crew created an aluminum shield to protect the nylon ropes from the car's exhaust. No one had attempted the world land speed record with such a powerful car before. The Blue Flame's crew were pioneers of a sort, and they had to keep coming up with backup plan after backup plan in order to get the systems to perform correctly. The Milwaukee Journal article "Leak Stops Rocket Car" reported, "A valve broke under the stress of repeated attempts at the world land speed record by The Blue Flame and stalled the racer Thursday on the very edge of success." Apparently this caused a hose to break loose,

“spraying hydrogen peroxide over the 38 foot racer’s sleek nose and sending up dark clouds of smoke.”

Time was ticking and money was running out.

In “Record Ride on the Tip of an Arrow” published in *True* magazine in 1971 Gary Gabelich wrote about that last morning, October 23, 1970. He wrote, “I added it up: 5 weeks, 24 runs, the physical strain, three times shot across the salt without drag chutes, the explosion and the fire, the frustration of the turnarounds, the heat of the afternoon sun baking you inside your fire suit - it all came to zero. I hadn’t set a record yet.”

Gary tried to coax the car himself. While the crew fueled up *The Flame*, he walked around the car. In his 1971 narrative he described the sweet talk he murmured to her that day.

“Come on, baby, this is it. We gotta get it on. If we don’t do it today we both go home losers. Don’t let me down. Get it *on*.”

The Indianapolis Star reported that project manager, Dean Dietrich, “admitted that the crew was ready to scrub the speed attempt for this year if the record was not cracked this week.”

I believe it all comes down to the sponsor’s decision not to test the rocket at the Malta Test Station. Pete Farnsworth and a group of team members did test the rocket motor, but they tested it themselves at the Great Lakes Dragaway in Union Grove, Wisconsin, a test that I believe was grossly inadequate.

According to newspaper coverage of the test, steel cables held *The Blue Flame* in place, tethering it to a concrete and steel post sunk 12 feet into the ground. The car underwent three days of testing at Great Lakes Dragaway and was able to produce 12,400 pounds of thrust. The news article states that by Friday of that week water vapor (steam) was the only exhaust emitted from the car. The steam exhaust knocked down plants growing 50 yards away. The headlines claimed that the tests were a success, but I knew that wasn’t true. If the engine were working properly for the duration of those tests, the reporter would have seen the telltale red and blue exhaust flame 20 to 30 feet long.

But there was no flame. During those tests, the motor was ruined.

v v v

One rainy afternoon in the middle of October, 1970, Gary Gabelich showed up at my door in Germantown, Wisconsin. I don’t know if he came on his own accord, or if he was asked to visit me by the crew at Bonneville. I didn’t ask. Cheryl and Phyllis were ecstatic to see Gary since I think they both had a crush on him.

We settled ourselves on the couch in our living room. Through the window I could see the headlights of the commuters rushing home along Pilgrim Road and hear the uneven bursts of acceleration as cars tried to switch lanes and pass the slower cars in their way. Phyllis brought in two Miller High Life beers and a bowl of my favorite French Burnt Peanuts and set them on the coffee table in front of the couch.

Phyllis sat down in the gold upholstered easy chair across from the couch and said, “So nice to see you, Gary. What a surprise! Aren’t you busy setting world records?”

Cheryl pranced into the room. Her dark, curly hair was in pigtails and she was practically dancing a jig in her red and white romper and white ankle socks. She chanted, "Gary! Gary! I have something for you!"

Gary turned towards Cheryl and smiled. She visibly melted a few inches under his gaze.

"Really? What do you have?" he asked.

Cheryl beamed. "Love beads. I made Love Beads for you! They will bring you good luck when you drive the rocket car."

She held out a string of tiny red, white and blue beads on an elastic string. The beads formed a tight circle of love and good luck for Cheryl's hero.

"You are a sweetheart!" said Gary. "I will be proud to wear love beads from my favorite girl when I drive the rocket car."

He reached out and took the necklace from Cheryl and placed it around his neck. Cheryl swayed back and forth with a loopy grin on her freckled face. I thought she was going to collapse and hit her head on the coffee table. Phyllis got up to escort Cheryl back to the kitchen and away from Gary's magnetic powers.

"Cheryl, why don't we finish your homework," she said. "I can read with you for a while so your father and Gary have a chance to talk." Gary and I sipped our beers and popped a few Burnt Peanuts. The peanuts had a hard candy coating over them that resulted in a satisfying sweet and salty crunch.

"So, I take it this visit is more than an update on the car. I've been following the news and I guess you guys have had a hard time so far."

Gary nodded and took a deep breath. His exhale was one long sigh. He started to say something, but stopped himself with another sip of beer. Gary set his can down on the coffee table and turned to me.

"Ray, we could use your help out there," he said. "The engine isn't working right and we've tried everything. The weather isn't going to hold much longer."

I looked out the window and squinted at the onrush of headlights. We should really get some better drapes, I thought, trying to distract myself. There was only one way I'd agree to help fix the rocket engine.

"I would come out there if we get ownership of the car again," I told him.

"That's probably not going to happen, though, Ray."

"I know," I nodded. "I know."

He left later that night and returned to the salt alone. I returned to my family, trying to put The Blue Flame out of my thoughts.

v v v

The team at the Bonneville Salt Flats was running out of time and good weather. The land speed season in Utah only lasts until the first rains hit the salt each October. Gary and the crew were scrambling and trying to force more power from The Flame.

The crew was beating the hell out of the rocket motor, trying to squeeze enough horsepower out of it to set the record. The rocket was damaged, and they didn't know how to fix it. They called Jim McCormick in Buffalo, and he advised the team to get a new catalyist

pack made in Salt Lake City since the first one was contaminated when unburned LNG passed through the pack's silver mesh. The crew obtained a new catalyst pack, but the car still wouldn't run fast enough. It needed phase two and three of the rocket firing and they'd never get there without three crucial parts operating correctly: the catalyst pack, the flow control orifice and the heat exchanger. Their only choice was to keep sending Gary and the car across the salt and hope to squeak out just enough horsepower to capture the record.

The Federation International de l'Automobile (FIA) has jurisdiction over world land speed records and dictates the rules of a successful land speed record. The FIA requires that a land speed vehicle complete two runs over a measured mile. The vehicle passes through the measured mile in one direction and then a return run in the opposite direction must be made within 60 minutes. The average speed of the two runs would be the recorded speed for each land speed record attempt.

No one from Dean Dietrich's Blue Flame team anticipated that it would take so long to set the record. Fuel became an issue because Gary was making so many unsuccessful runs. The record was finally broken on the last available day of racing with the help of Dana Fuller, a photographer for The Guinness Book of World Records.

Dana was covering the record attempt and taking photos for Guinness Book for much of the five weeks The Blue Flame was out at the flats. He owned a truck with a powerful engine that had been modified so he could get around in rough terrain such as salt flats. Dana was using this truck at Bonneville as home and field studio. He had an idea.

Dana approached the crew and offered to use his truck to push The Blue Flame up to about 75 miles per hour, then drop back and drive to one side so Gary could start the engine without damaging Dana's truck. This strategy would provide a couple of seconds more of full power while passing through the measured mile. Dana thought the problem with setting the record after everything of a technical nature had been resolved could be lack of fuel. Dana's theory was that the car was running out of fuel and decelerating during the measured mile.

The crew thought it was worth a try.

v v v

The Broadcast-Milwaukee, WI: October 23, 1970

"Gary Gabelich is officially the fastest man on earth. He piloted The Blue Flame to 622.407 miles per hour, a new world land speed record, today along a one-mile course of the famous Bonneville Salt Flats. The Blue Flame rocket car destroyed the previous land speed record held by Craig Breedlove. Breedlove went just over 600 miles per hour in his Spirit of America car back in 1965..."

My head jerked up when it registered. I expected the same type of radio broadcast about The Blue Flame just missing the record or another engine problem plaguing the crew. Every day the WTMJ broadcasters would give a bleak update about The Blue Flame's quest for a land speed record so I expected more of the same today. Shocked, I slapped the switch on the drill press and didn't even wait for it to grind to a halt. I fished my

handkerchief out of my pants pocket and my Ewing Engineering baseball cap from the nearby work bench. I swiped the sweat from my forehead and jammed the cap onto my head. I glanced around the workshop for someone to tell, then decided not to. Why bother. I left the radio playing as I pushed open the side door of the workshop and stepped into the bright October sunshine.

The door slammed behind me, drowning out my words. But I heard them and felt them as they erupted from the depths of my disbelief.

“What a waste!”

v v v

Dana Fuller’s offer was accepted and a special push bar was fabricated on site and welded to the front bumper of the truck. Dana jumped in his truck and tried it out and it worked fine.

On October 23, 1970, Dana Fuller’s truck pushed the Flame to give it a running start. The record was broken in the first two attempts. The speed for Gary’s first run was 617.02 mph. The crew took 52 minutes to turn the car around, repack the parachutes and examine the car to make sure it was ready to return down the salt track. The speed of the second run was 627.287 mph, which earned the world land speed record for The Blue Flame with an average speed of 622.407 mph.

Dana Fuller saved the day. Without him, The Blue Flame would not have broken the record in 1970. It was a brilliant idea and very generous. Dana’s truck could have been ruined in the process.

Gary remembered how it felt to set the record. In the 1971 *True* article he wrote, “Everyone was running around shooting pictures and asking how it felt and all I could say was ‘Beautiful, just *beautiful*.’”

It started to snow within a matter of hours of the new world land speed record. Winter had arrived at the Bonneville Salt Flats, officially ending the 1970 racing season.

I believe the Blue Flame would have set a land speed record greater than 800 miles per hour if the rocket engine had been tested, tuned up at the Malta Test Station, then properly installed in the car with my LNG flow control orifices prior to going to Bonneville. It would only have taken two runs on a day with good weather.

The promotional videos published by the sponsor after the record was set must be of earlier, unsuccessful runs. I believe this because in all these years I haven’t seen any videos with a pickup truck pushing The Blue Flame around.

The Blue Flame held the land speed record for 13 years even though it only used half of its power.

It is still the fastest American-built car ever made.



The Blue Flame and some of the crewmembers at the Bonneville Salt Flats near Wendover, Utah (Photo courtesy of the Peter and Leah Farnsworth Collection)



The Blue Flame at the end of a high speed run. The parachute is out to slow it from over 600 miles per hour on the Bonneville Salt Flats (Photo courtesy of the Peter and Leah Farnsworth Collection)



The sun sets on the Salt Flats, The Blue Flame and its crew (Photo courtesy of the Peter and Leah Farnsworth Collection)

FROM CHAPTER 23

Workbench Clue and Mystery Solved

1971



The Blue Flame on display at McCormick Place in Chicago after setting the world land speed record (Photo courtesy of Roger Dausman)

The Blue Flame made a victory lap around The United States and part of Europe after setting a new land speed record. Articles in *Life*, *Paris Match*, Germany's *Stern Briefe* and Italy's *Aviorama* in-flight magazine proclaimed the glory of The Blue Flame. Europeans were especially enamored with Gary Gabelich and his rocket-powered car because The Blue Flame was the first car to travel 1,000 kilometers per hour (kmh). Automobile collectors became smitten with the idea of owning The Flame. IGT sold The Blue Flame, I have heard, to a Dutch oil executive for \$10,000. That executive was a member of an exotic car collectors club that houses their personal collections at the Auto & Technik Museum in Sinsheim, Germany.

The Blue Flame returned from its promotional tour and was parked behind the IGT offices in Illinois. After The Blue Flame was sold, it was returned to Milwaukee for shipment to its new owner in Europe. Pete Farnsworth invited me to the Reaction Dynamics shop to look it over. Our relationship was still tense, so I appreciated his thoughtfulness.

When I arrived at the shop Pete was the only one there.

"Hi, Ray," he said, as we shook hands. "Go ahead and look her over. I need to get some of these tanks out so we can ship her to Amsterdam."

“How are things going, Pete?’ I asked “How’s Leah?”

“Good, good. She’s same as always. What about your family?”

“Good, we’re all good. We’ve got four kids now. Our son Paul was born in July.”

“Congratulations. That’s great, Ray.”

“Let me know if you need a hand,” I said. It was good to see my one-time business partner.

Pete smiled and nodded as he turned his attention to his task at hand. The new owner wanted all of the heavy tanks and hoses removed from the car so it would be easier and less expensive to ship to Europe. The rocket engine would go with the car, so this was my last chance to examine the damage to my rocket. The shop was quiet, except for the occasional cough or clank of a wrench.

I looked over the plumbing system that the record-setting car contained and I saw that it wasn’t my design. This confirmed that the rocket motor had been installed incorrectly. I turned away, disgusted. My hunch was correct all along.

I looked around to see what had changed in the shop. Everything looked pretty much as it had been on my last day in December 1969. The same posters were on the wall and there were familiar boxes of parts stacked on the floor and resting on shelves along the wall next to the chalkboard. I could hear Pete pulling on one of the large fuel tanks and cursing, so I turned to offer him some help.

My eyes skipped over the workbench along the wall.

Suddenly, my heart leapt to my throat and I felt my stomach constrict as if I had been punched.

There it was.

The flow control orifice sat on the workbench, on the same workbench and in the same spot where I had placed it in December, 1969.

It was covered in dust.

They had left it out.



The Blue Flame's damaged heat exchanger.

v v v

I admit, there were times when I would think about The Blue Flame with what I can best describe as longing and melancholy. Once in a while I would allow myself to ponder and play the “What if...” game. What if the sponsor had been reasonable and not demanded ownership of the car? What if they had installed the rocket correctly? Where would I be then?

Forty years after The Blue Flame's historic runs at Bonneville Salt Flats I was on the telephone with Dick Keller. We were talking about a possible reunion for The Blue Flame crew. During our conversation about the past he said to me that people will always say, “We woulda, shoulda, coulda done something different.”

I was for saying “shoulda” in 1969!

Over the years, if I was busy, I wouldn't even think about The Blue Flame. But if I had any amount of time on my hands I would get to wondering. Thoughts of The Blue Flame would creep in if I were waiting for a flight at the airport or driving around trying to find a hotel on a business trip. Or if I wasn't too happy about the current project I was on, I'd stop and wonder what it would be like if I had my own company again. Times like that, The Flame would enter my thoughts.

This wondering over the years wasn't too painful. It produced a small ache and highlighted an empty spot I had in my heart.

It was when I saw the car again that I really felt the regret and frustration I had kept locked up for so long.