



A SWIFT ENTERPRISES INVENTION STORY

## Tom Swift and the Plasma HeadLights

By T. Edward Fox

Waylaid by a crippling dust storm, Tom Swift is stuck in his 4x4 waiting for a break so he can return to the Swift's nuclear research facility, the Citadel. While he sits listening to sporadic radio signals from the nearby town's little AM station, he realizes that the entire area is engulfed and at a total standstill for minutes, hours and even days at a time with these increasingly occurring dust storms.

And, when he later discovers an accident that nearly leads to a young man's death while waiting for an ambulance that couldn't come because the driver could not see through the blowing dust and sand, he becomes determined to come up with a new type of headlight, one that might be able to cut through practically anything.

Along with how to pierce the enveloping darkness, his biggest problem is overcoming the high level of energy that will be needed by such a light, more than any standard vehicle could ever carry or provide!

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This story is dedicated to the many uses of plasma. From cutting things apart to powering futuristic spaceships to replacing human blood, to... Oh. Wait. Different *plasma*. Anyway, put power in and get amazing things back out.

## Tom Swift and the Plasma HeadLights

### FOREWORD

Tom Swift hates death. Even his most vile enemies don't deserve it when caught. But, particularly when death comes simply because someone hasn't yet found a way to avoid it.

Several of the medical devices he has created over the months and years of his young life came about because his own life was almost lost. Some are only in use at Swift Enterprises and other Swift facilities and some have or are becoming de facto standards of medical practice.

Like his 3D sonic imaging system and the self-maintaining cast/tourniquet systems.

When I heard about his determination to save more lives and to make it easier for some people to do their emergency jobs, I just sat back, nodding.

Of course, I thought. Tom *would* do that! Heck. Tom *can* do that!

*Victor Appleton II*

## CHAPTER 1 /

### STRIKE AN ELECTRONIC MATCH

"WHERE'S THE SKIPPER?" Bud Barclay asked in a very worried voice. "Nobody at the gate saw him come back from his errand. Has anyone heard from him?" He was practically shouting into the phone as he tried to get answers to the location of Tom Swift.

The young inventor and his best friend arrived at the Swift's atomic research facility, The Citadel, in New Mexico a day earlier so that Tom could perform a special software dump and total reboot of his giant robot that inhabited the radioactive catacombs connecting the various reactor buildings. Forever imprisoned behind thick shielding, ATOR performed duties ranging from refueling to radiation level checks to daily maintenance. It was though his diligence and programming that the facility had the highest possible safety rating the Nuclear Regulatory Commission could award.

Now, approaching the one-year anniversary of his being sealed in, ATOR II—the successor to the first and now-decommissioned ATOR—was in need of improvements. 'He' was also in need of some low-level maintenance of his own, and the new programming would allow him to perform whatever steps were needed to keep him at peak condition.

Both Tom and Bud had come out from Shopton with requests from their girlfriends. Sandy, Tom's sister and Bud's girl of choice, loved the turquoise jewelry created by an artist in the nearby town of Tenderly.

Bashalli Prandit, the Pakistani-born woman Tom had been dating for fourteen months, wasn't as impressed with the bluish stones, but she loved some of the intricate silver work

that same artist was known for. She had requested a simple pendant.

Leaving Bud behind to arrange a shipment of some components out from Enterprises Tom had not realized would be needed before they departed, the inventor had made a rushed trip into town—about thirty miles away—to take the artist a drawing of what Bashalli hoped he might be able to make for her.

That had been four hours ago, and just two hours before one of the increasingly-common and increasingly-dangerous sand and dust storms had begun blowing.

So much high-powered static electricity built up in the dry and dusty conditions that it effectively blocked out most radio transmissions. But, foremost, it made it impossible to send anyone out to look for him. Visibility could be measured in inches at times, and most vehicles came out of these storms looking as if they had just visited a sandblasting facility. Anyone attempting to drive in such a storm was just asking for an accident. They generally got their wish!

Tom's father, Damon Swift, had finally decided that constantly repainting Swift vehicles was a waste of time and money, so he had authorized each vehicle to be covered in a thin yet incredibly strong layer of Tomasite, the amazing non-polymer plastic he had created years earlier.

That had led to a confrontation with the local New Mexico Sheriff's office when it was discovered that such Tomasite-coated vehicles could not be effectively tracked on their RADAR. The Sheriff claimed that it was unfair and that he "jest knowed" that employees at The Citadel were taking unfair advantage of it and driving over the speed limit, and were "speedin' 'long like demons or sumpin'."

He dropped a court case when Damon Swift said that he

would remove the coating if, and only if, the Sheriff promised to repaint all of the affected vehicles at least three times a year.

In return, Damon admonished the men and women at the facility to "Try to keep it down just a bit." Things had been relatively quiet ever since.

Now, one of the worst storms of the year was hitting the area with almost no fore-notice, and Tom was missing. Nobody assumed the worst, but it was very uncomfortable not knowing his whereabouts.

"Gimme a jeep an' a good bandana handkerchief fer my face, an' I'll go git him," Chow Winker had offered. "Shucks. I been out in worse'n this."

Saner heads prevailed and the old wester ranch cook, now Swift Enterprises chef and head of Food Services clomped back to his kitchen in the main Administration building. He could be heard muttering something about being "too big and fat to be blown away by some namby-pamby dust devils," as he walked by a group of employees.

The only certain communication they had out of the facility was the Private Ear system that could be pointed directly to the Swifts outpost in geosynchronous orbit over the equator. It was not only impossible to eavesdrop on the tight beam but it also wasn't affected by such things as bad weather or most building materials.

The call was made and Bud was soon speaking with the radioman on duty at the station. "Brian? Can you guys take a look down here with the prober and see if you can break through the dust? Tom ought to be somewhere between us and a point northwest of us about thirty miles. See if you can spot the highway. He'd be on that."

"Sure. You want to wait or want me to call back?"

"Go ahead a call back, even if you can't spot him," the flier replied. After disconnecting the call, he told the operator sitting next to him, "I wish we had something I could fly up there to take a look!"

"Can't help you there, Bud," the young woman said. "I'm one of the spark set, not an air-head, if you know what I mean." She favored him with a smile. Bud looked at her for a moment more before realizing that she was still smiling. He became a little warm and could feel his face turning pink with mild embarrassment. She was still beaming at him.

He seemed to have a similar effect on many young women.

"Got to go. TeleVoc me when the call comes back." With that, he made a hasty exit, heading for the cafeteria and a cold drink.

\* \* \* \* \*

Tom Swift sat in his 4x4 parked about fifty feet off the main road. As the storm had swarmed in over his head, he quickly realized that it would settle to the ground within seconds and any further driving might be hazardous, or even deadly. He pulled off the road as fast as he could and shut the engine off.

"No need to suck dust and grit into the air filter," he told himself.

He picked up the radio mic and tried to call The Citadel. As he feared, there was nothing but static coming back out of the speaker. Just in case they could hear him, even if he could not hear them, he broadcast his approximate position.

"I'm just off the highway about half way between town and the base. I found a small gully to get into so I'm partly below ground for a bit more safety. Be back as soon as it blows over."

He repeated the message three times and then settled down for the duration.

He turned on the truck's AM radio and listened to the

sporadic signal. He could catch little bits and snatches of tunes and of what sounded to be dire warnings about driving out in the storms. Ten minutes later he turned the radio off.

As usual, whenever Tom had a few minutes of unexpected free time, his mind began contemplating inventions, both old and new. He was always looking for ways to improve things and to come up with new ones to improve things for people. The storm was providing him with several potentials to ponder. For starters, was there some way to overcome the static interference that shut down practically all forms of communications? Some sort of interference filter? Hmmm!

He tried to recall everything he knew about the types of voltages and the associated frequencies that could be affected. Taking out his small tablet computer, he called up a notebook application and spent the next ten minutes jotting down several ideas and things he wanted to research.

Tom sat back and looked around. It had become noticeably darker outside, practically night-like. Since it was still four hours until sundown, he knew that the storm was getting thicker. He looked up to where he imagined the sun would be and couldn't even detect a hit of the glowing orb.

*That, he thought, is possible one of the worst parts of these storms. You can't even see your hand in front of your face, if you're foolish enough to be out in that!*

It used to be so simple. Strike a match at night and you got light. With light, you saw what was around you. Here, not only would the match probably refuse to light—or would only stay lit for a split second—the darned match might just be yanked from your fingers and go sailing away.

*Ah, to have something along the likes of an all-penetrating electronic lamp and an electrical match to light it!*

**CHAPTER 2 /****MIGHT HAVE HELPED**

UNSEEN BY TOM, a young man, rushing back home from a trip into town to get his 2-year-old son some ice cream for his birthday party, ran off the road and crashed through a large grove of Cholla cactus. His small car overturned, rolling twice, and came to rest just a dozen yards from Tom's truck.

He tried to cry out but found that he could barely breathe much less shout. The man could feel a trickle of blood running up his chest and up his neck to his chin. It was then he realized that he was upside down with the roof of his car smashed up and shoving his head to one side, cutting off almost all his air.

For a half hour he tried to shift his position, to escape the wreck if possible, but to no avail. Finally, darkness swam through his head and he passed out, the trickle of blood still running over the underside of his chin and into his hair.

\* \* \* \* \*

Tom sat the storm out, occasionally attempting to reach The Citadel, or anyone for that matter, on his radio. It had been during one such attempt with the truck being filled with the noises of static, that the accident had taken place. He was totally unaware of the dying man just a few yards away.

Almost fifty minutes went by before he detected a slight break in the roiling dust and debris. He tried his radio again, this time getting through for a few seconds, just long enough for the radio operator at The Citadel to hear that Tom was calling. Then, the storm closed back in and the connection was broken.

It took another twenty-five minutes of waiting until Tom

could get a good, continuous signal. He was just describing his location when something caught his eye in his rearview mirror.

“Citadel. There's a crashed car just behind me. Must have happened during the storm. Get an ambulance out here, pronto! Give them my coordinates from the GPS locator. I'll wait here until they arrive.”

He reached into the back seat, grabbing the emergency first aid kit that all Citadel—and all other Swift facilities—vehicles carried.

His door was jammed shut by an accumulation of sand and sticks, so he rolled down the window and climbed out. Although the storm had not fully stopped, he was able to get to the little car in seconds, shielding his face with his free arm.

Dropping to his knees Tom looked into the upturned car. He let out a cry of dismay. There, blood running down his face, was a red-haired young man, probably not much older than Tom himself, still strapped into his seatbelt. The man was not moving. But, Tom realized with relief, running blood means a running heart, so he was still alive.

The side window in front of Tom was bowed out but had not broken. It was obvious that he would never be able to roll it down, so Tom looked into his emergency kit. There he located the special, spring-loaded tool that could break safety glass. He pressed the business end to the glass—glad to know that the trapped man's face was away from any spray of shards—and clicked the activate button.

Instantly, the sharp metal tip slammed into the glass and the window shattered into a thousand bits, most of it falling away and to the ground. Tom cleared the rest of the shards using his jacket sleeve and then crawled as far as he could into the car.

He maneuvered one arm around so he could feel the man's neck. There was, as he assumed there would be, a pulse. It

seemed weak and a little uneven, but it was something.

“Can you hear me?” he asked the man. He squeezed the man’s shoulder and asked again if he could hear. There was no response, so Tom pushed himself farther into the car’s interior and began feeling for the man’s extremities. His left arm seemed to be fine, but Tom could tell his right arm was broken in at least one place just below the elbow and that the right hand seemed distorted, probably also broken. He could only get about three-quarters of the way down the man’s left leg—nothing obvious—and to the knee of the right one—again, nothing obviously broken or out of place.

The thing that worried Tom was the position of the man’s neck. It was cocked over toward his right shoulder and pinned up—or rather down—against the ceiling of the car. He was imagining a broken neck or spinal injury and hoped the man wasn’t in pain.

As Tom tried feeling carefully around the man’s head for any skull fracture, he was startled to see the driver’s left eye slowly open and start directly at Tom.

“Hey! You’re going to be okay. My names’s Tom. I’ve called for help; they should be here in less that ten minutes I’d guess,” he told the man although it appeared that the man could not hear him. “What’s your name?”

The man’s eye moved around slightly and then closed. He made no reply to Tom’s question.

Tom eased himself back out and ran to his truck where he pulled an emergency blanket out of the glove box. He opened the small packet and climbed back into the man’s car, wrapping it around the injured driver as best he could. It wasn’t that it was cold—even the dust storm had only lowered the temperature to about 70 degrees—it was just that Tom’s first aid training told him that the man would be in shock and

the best thing to do was to keep his body temperature stable.

Twelve minutes later Tom could hear a siren. He told the driver that he would be right back, even though he man had not re-opened his eye and appeared to be unconscious. Tom pushed himself backward until he was clear, and then jogged to the road arriving in time to watch a State Police car race past, its light flashing and the driver madly motioning Tom to get out of the way.

His shoulders sagged. He had thought it must be help arriving. Tom turned to go back to the car, but just as the police car’s siren disappeared in the distance toward The Citadel, another siren seemed to be coming up from the opposite direction.

A minute later an ambulance screeched to a halt next to Tom.

“You the one called in the car accident?” the driver asked.

“Yes. He’s right over there. He’s bleeding, upside down, with a weak pulse and at least his right arm is broken. His head is pushed to the side but I didn’t want to try to move it. HAVING difficulty breathing, too.”

“Good kid,” the second man told him as he opened the rear doors and began pulling out several boxes of medical equipment. “Help me get these over there.”

Ten minutes later, with a pair of IVs going into the man’s left arm, the EMTs had managed to get the driver’s head and neck stabilized using—to Tom’s amusement—one of the self-setting splint and tourniquets he had invented a year earlier. With one EMT holding the man, Tom and the other slowly pushed the car over onto its side. From that position the three were able to lift the man out of the car and get him onto a back support board. His chest wound was bandaged and they prepped him for transport with Tom standing to one side.

As the ambulance driver was getting back into the vehicle to rush the injured man to a hospital he turned to Tom. “Ya done good, kid. And, ya kinda look familiar. What’s yer name?” He held out a hand to the young inventor.

“Tom Swift. Please get word back to The Citadel on his condition. Okay?”

Stunned at who he believed to just be some local kid, the driver agreed to do that. A minute later the ambulance was speeding back toward the small town and it’s hospital.

Tom grabbed his kit and the discarded Mylar blanket and got back into his truck. Radioing out, he let the facility know he would be there within the half hour. He was about to start the truck when the same state police car that had sped past him pulled up next to Tom’s truck. He rolled down his window.

“Hey, sonny. You seen an accident around here?” the officer asked. “And, a missing ambulance?”

“You just missed it all. Might have even been able to help if you hadn’t gone racing past me before,” he said as sarcastically as possible before rolling up his window and driving away from the baffled policeman.

Back at The Citadel, Tom filled Bud in on his recent frustrating experience. “It is all so stupid, Bud,” he stated. “I mean, here I can send messages millions of miles across the solar system, we can talk as easily under water as you and I do here, and yet a simple bunch of dust paralyzes everything from cars to radios. Even if I can’t fix the communications thing, yet,” he grinned ruefully at Bud, “I’ve *got* to come up with some way to let emergency vehicles get out to people who need them. As in, before it’s too late to make a difference!”

“You’ll figure something out, I have faith,” Bud told him with an honest admiration for his best friend’s capabilities evident in his voice.

“I sure hope your faith in me isn’t misplaced,” Tom muttered as he turned away, heading down the corridor.

He went to the small laboratory he kept in the building and sat at his desk thinking about what had just happened. It took a good hour before he could put his anger at the idiotic state trooper out of his mind and concentrate on the real issues.

“It was all but impossible to see anything, Dad,” he told his father on the phone later that evening. “I’ve never been in anything like it. Crippling doesn’t half describe it.”

“I know, Son. Believe me, I know. For the first few years the plant was out there they had maybe one good duster a year. I got caught in one. Now, with global warming, it seems as if they get five. And, they are more severe than ever. You’re right. They absolutely cripple everything. Police. Fire. Ambulance. Commerce. Nothing moves. And, those who are foolish enough to try driving in one of them often find their air filters clog up in minutes and their cars just stop.”

“Is that why there are so many accidents?” Tom asked.

“My understanding is that about half of the big pileups start with one car conking out and the one behind them plows right into them. Then another and another.”

“I have to find a way to help,” Tom stated with resolve. “That poor guy could have died right behind me and I’d have never noticed it if the storm hadn’t let up a little. There’s got to be a way to let people see through that stuff!”

**CHAPTER 3 /****LET THERE BE...**

IN THE NEXT two days, Tom concluded his work at The Citadel and he and Bud headed back to Shopton where his girlfriend fussed and fretted around him and what she called his “close call with the Grim Reaper.”

“Aw, come on, Bash. I was safe in the truck.”

“Oh, really? What if the little car had been one of those big rig trucks? What if it had rolled over your truck? Would I be sitting here with the man I... um, with you right now?”

Tom blushed, realizing what Bashalli had almost said. She had told him of her love for him several times but still seemed nervous about stating it outright and in front of witnesses.

“Tomonomo?”

“Yeah, San?”

“If that dust storm is so, well, thick, how can you possibly make it so people can see through it. I mean, isn’t it like trying to look through solid rock?”

“Or, heavy fog?” his mother, Anne, added.

“Well, unlike solid rock, the dust storm is only about eight to ten percent solids. Any more than that and it would be battering everything into little pieces. That means there is ninety percent or more open space in there. I’ve just got the find a way to see through those spaces.”

“A very bright light, dear?” his mother inquired.

“It would have to be a doozy of a light, Momsie. But,” he paused briefly as a new thought hit him, “it isn’t impossible. I

mean, look at lighthouses. Their light can be seen even miles out to sea in the densest fog because they use such a high-powered and focused beam of light. Maybe that’s where I need to start.”

He sat back with a smile and allowed the conversation to be shifted to talking about the newest movie to hit the Shopton Theater.

The next morning he sat down at his computer in the small office and lab he had next to the *Sky Queen’s* underground hangar. An hour of research on lighthouses told him that it wasn’t just a matter of the brightness of the light, it was also a combination of the type of light and the special Fresnel lenses used to concentrate and aim that light.

At lunch he described his findings to Bud.

“My first thought was to create a large spotlight that could be mounted on a fire truck or ambulance. But then it hit me that there are a lot of things against that. Size, weight and available power to run the thing for starters.”

“How much power, skipper?” the dark-haired flyer asked around a mouthful of burrito.

“Well, my best guess right now is over ten thousand volts at fairly high amperage to drive existing lamps. That’s doable if you have space for something about three feet by three feet by four feet and weighing around twelve hundred pounds.”

Swallowing first so he wouldn’t spray any food, Bud whistled. “That’s a little bigger than I pictured. I was picturing something more like a new, powerful headlight that any car would use.” He took another bite from his burrito and was happily munching away while Tom sat there, new thoughts zooming around his head.

He slammed his hand down on the table, startling both Bud



and the three secretaries at the nearest table in the cafeteria. "Why not, Bud? Why not!"

Bud looked over at the women and shrugged. "Genius," he said as if to explain Tom's behavior. They smiled politely, looked at one another and all got up and moved to a table farther away.

When he returned to his lab, Tom began sketching out a new power circuit he was considering. It would be fairly easy to create the high voltage, but bringing up the amperage was another thing. That was what took up so much space in high-power transformers.

He considered ways to either circumvent or to overcome limitations necessary when designing a small board that might be powered from a typical automotive battery.

It took three days, but he finally believed he might be onto something. It was a departure from the direction he initially believed would be successful, but it seemed feasible if not a bit science fiction-ish.

A computer simulation had assisted in fine tuning the design and function of a totally new type of electronic component and lamp system. It was so different that he knew there would be no way to avoid hand-building the first one, so he set to work.

Tom spent the entire weekend creating his new component—part of which entailed going to the Enterprises electronics good storerooms scouring for items to use and then to the Shopton Hardware Store for a few other things—and the headlamp that it would power.

In the end, he had something that looked partly normal and partly extremely odd, almost as if a radio circuit had been in an accident with an auto repair facility.

"What's the funnel thing on the board on the workbench?"

Bud asked on seeing Tom's latest electronic advancement.

"It's a funnel," Tom told him, straight-faced.

Bud sighed. "No, really, skipper. I know what it looks like, I've got one like that but a little larger I use for adding oil to my car, but what's it doing on that circuit board?"

"That, Bud, is what I want to call a recurring, multiplying, auto-advancing capacitor, but I'll bet I can think of a better term, given the time. Or, I can give in to the inevitable and have you come up with one."

Bud had a huge grin on his face as he settled down onto one of the stools at the far end of the bench. Rubbing his hand together in anticipation, he asked, "What's it do?"

"To answer that I have to tell you a little about how traditional capacitors work. A direct current charge goes in one side and begins building up. You see, a capacitor is kind of like a temporary battery, it's just one that keeps letting the charge build and build until it is either triggered by some outside means, or it overflows and rushes out all at one time. Well, usually."

"So, you go over capacity on the capacitor and it *un-capacitizes* or something like that?"

"Maybe something like that. Anyway," he said with a shake of his head at his goofy friend, "mine starts out almost like a current—that's current as in *modern* and not as in a type of tiny raisin—capacitor with the power coming in down at the bottom. That power builds up in the lowest part of the funnel and then is bled off in a flash once it reaches a specific level. That higher level of power goes through a special amplifying coil that circles the entire inner wall before it is fed into a larger capacitor. That one feeds into a longer power coil and another, larger capacitor and so on until it reaches the coil at the top, runs down the middle via a cable to the board, and

exits at a very high voltage, along with a slight increase amperage. It could knock down an elephant but not kill a human if you came into contact with it. Barely."

Bud, who had been nodding seriously as Tom described the conical device raised a hand. "I thought you had said you needed really high amperage. Something change?"

"Yes it did. I realized that I had been thinking about traditional light sources. You know. Power in one side of a spiral filament in a sealed vacuum globe and it heats up and you get light as a byproduct of all that heat. This new device," he swept his right hand toward the board, funnel-like capacitor and familiar-looking headlight connected to one side, "generates a plasma beam that is about two hundred times brighter than even the brightest modern headlight. It arcs inside this almost solid Tomasite housing, under pressure, not a vacuum, and then shines out of the special lens in the front!"

He smiled at his friend. "What you don't see here is the second part of the system, a tank that will hold liquid hydrogen for the plasma process. I figure a one cubic foot container will hold enough for a couple hours of use for a pair of the new lights. Maybe three."

"I've got another question, professor," Bud said looking straight at the component.

"Sure. Ask away."

"Why? I mean, why all of this instead of just using a larger bulb?"

"For starters, no 'larger bulb' can give off enough light. The plasma beam does. I need to be able to amplify the power that can be drawn from a standard car's electrical system in order to power my new headlight. Without it, just one of these lamps could suck a battery empty in about two minutes, and firing off two of them would kill a running engine. In other words, if I

want these things to work and not force drivers to drag along miles of four-forty volt cable, I need to have a way to pump up the twelve volts to about six thousand volts."

Bud whistled. "Jetz! That *would* knock an elephant down." He continued studying the strange cone-shaped component. "Okay. Another question. Besides the big voltage, what else is special about that thing?" He pointed at the capacitor.

"The best thing about it is that it puts out a continuous stream of power once it has about two seconds to get up to speed, so to speak. It needs to do that so the light doesn't strobe. That would effectively kill the plasma beam."

"And, regular capacitors would strobe?"

"They would, indeed. Because the power in my new—" he paused, "What *am* I going to call it, Bud?"

"Hmmm? CoilCap? ConstantCap? FunnelCap? Swift High-Output PowerFunnel?"

Tom thought a moment before deciding. "Let's call it a CoilCap for now. Anyway, my CoilCap has one flaw that I am taking advantage of. There is so much power flowing around in there that it kind of get backed up a little. If such a thing were possible, it would be like the electricity gets put under pressure leaving no gaps in between the pulses. That means that by the time power exits, it has no individual capacitative discharges, just constant energy flow. Hence, constant power."

"Great! When do we test it?"

"I've arranged to have the environmental chamber tomorrow morning., Meet me in the Admin building basement at nine and we'll see what she can do."

By the time Bud arrived, Tom already had the basic system set up and was making the final connections to the operating computer. The board, complete with a now black CoilCap, sat

inside a protective clear box just inside the chamber.

“Black? Did you change things?” Bud asked, pointing at the component.

“No, but late yesterday I found that the thing was generating too much heat for the plastic to hold, so I molded a new outer case from the old one; it’s Durastress with an outer coating of a carbon fiber-based paint this time.”

“Neat. When does the show start?”

“Just give me a minute and we’ll close things up,” he told his friend.

Minutes later the chamber—more than fifty feet wide, circular and curving up into a dome thirty feet high—had been sealed and all the systems checked.

“Ready?” Tom asked.

“You bet! Bring on the storms!”

The computer began running the pre-programmed sequence. At first, there was little see as only the internal fan system was blowing inside the chamber. With nothing to blow around, it was all but invisible. But, seconds later, the first of the dust and other particles was introduced and was soon billowing around and swirling all over.

As more and more particulates were put into the chamber, the visibility dropped until neither Tom nor Bud could see anything inside. A glance at the monitor showing the view from a camera mounted just above Tom’s headlamp assembly told them that visibility was effectively zero.

Tom turned to Bud and grinned. “Well. Here goes. You do the honors,” he said pointing at the activation button.

“Let there be bright light!” Bud declared.

The plasma headlight began softly glowing and then,

suddenly, there was almost an explosion of blinding light.

Tom’s hand stabbed out and shut the light off.

It took several minutes for their vision to clear, and Tom spent that time shutting things off more by feel than sight.

“I was afraid of something like that,” he admitted to Bud. “I’ve made a great deal of light and it all just reflects back off of the particles in there. *It made things worse, not better!*”

**CHAPTER 4 /****SO, WHAT DO WE DO WITH IT NOW?**

DISMAYED at the failure of his new light, Tom was about to call off his date with Bashalli that evening when his father suggested otherwise.

“You need a night off. Good gosh, Son, this light thing is such a small thing on your plate and you’re practically running yourself into the ground over it. Why?”

“Because of what almost happened to that young may out in New Mexico, Dad. He could have died while waiting for help that couldn’t come. Can you imagine the helpless feeling his wife must have felt those first few days he was in the hospital, just knowing that his life had been slipping away in the middle of nowhere?” He looked beseechingly into his father’s eyes.

The older inventor felt a cold shudder run down his spine as the emotion Tom must be feeling slammed into him like an icy towel. “I hadn’t thought about it on those terms, Tom. You’re right, of course. Just take a little advice from your old man. Have a nice evening cuddling on the sofa in my office at home with Bashalli. Shut the doors and I’ll make certain your mother and sister leave the two of you alone. Heck. I’ll take ‘em both out to dinner and a movie. You just relax and watch a few TV shows. Relax and refresh. Okay?”

Tom smiled and nodded, slowly. “Thanks, Dad. I *do* need some time away from this, even if it is only one night.”

He turned and began to head toward the door when his father’s voice stopped him.

“Did we ever hear the outcome of that man’s injuries?”

Tom turned back. “Yeah. He lost a lot of blood and the

doctors had to force him into a coma for a week so his body could repair itself. He just came out of it two days ago. His chest was crushed, right arm and hand badly broken and he lost his left foot because of no circulation. His wife say’s he’ll be alright in another month or two. It’s gonna be rough going for them since she is about ready to have their baby, but she refused my offer of financial help, even once he gets ready for a prosthetic foot. They’re both pretty proud. And, stubborn.”

After Tom left, Damon picked up his phone and made a series of phone calls. Hanging up from the final one, he smiled to himself. Pride or not, things wouldn’t be as hard on the young family as it could have been before those calls.

Tom picked his date up and explained the evening’s plan to her. She grinned but then turned serious.

“Please do not tell my family about this evening, Thomas. Even though I am twenty-one, they still believe that it is improper for me to be alone in a house with you.” She gave him a little shrug as if to add, “What can I say. You know them!”

“Don’t worry, Bash. If the subject comes up I will honestly be able to tell them that we weren’t alone. Caesar and Brutus will be just outside.”

She smiled at the thought of the two bloodhound that lived in a huge enclosed area in the Swift back yard. Indeed, they would be more than enough deterrent for anything should they get into the house. Once there, all they would want to do would be to climb into Tom’s lap and try to lick him senseless.

With the rest of the Swifts departing about ten minutes after Tom and Bashalli arrived, the pair opted to watch the large screen television in the living room.

And, although Tom found most of the *genré* shows devoted to crime solving to be far too easy to figure out—he generally

had the plot and ending solved by the first commercial break—tonight, Tom willingly watched a new program that heavily featured technology used to solve crimes and uncover clues.

It was midway through the show that he suddenly stood up, practically dumping his poor girlfriend onto the floor in the process.

“Oh, sorry, Bash! It’s just that I think I’ve got it figured out!” He pulled her to her feet and gave her a big hug. Just as it seemed that she was going to return in, he pulled back. “It’s that light they were using,” he explained, sitting back down and drawing her back to sit next to him.

“The little flashlight?” she asked. “The one that they changed from white to red to blue?”

“Yep! That’s the one. The alternate light source. It lets you see things that regular lights just don’t reveal.”

He told her even more about the light than the script writers had the main characters discussing. How certain substances—blood, mucus, certain chemicals—were all but invisible when lit by light in the normal, visible spectrum.

“I’ll just bet you that I can find a type of light that not only doesn’t reflect back from all the dust, it should let me see almost right through it!”

Bashalli rewarded the inventor with a kiss for his genius, and then rewarded him several more times, just because she felt like it!

Bright and early the following morning, Tom got to work creating a light projection system capable of a wide range of visible and invisible light waves. By noon he had the device complete, albeit as a breadboard of components and several emitters, and was prepared to give it a test. As he started placing everything on a roll-around cart to take it to the test

chamber, Bud came into his lab.

“Seems like every time I come it you’ve got more and more electronic spaghetti and doohickies all wired up. What is it this time?”

Tom explained the setup.

“Jets! And, you think that will let you see right through all the storm and stuff?”

“Well, that’s the hope. The more I think about it, though, it may just be part of the solution.”

“Why?”

“You remember our undersea light system, right?”

Bud nodded. He knew that all Swift ocean-going vessels were now outfitted with a special type of light and that view ports and camera lenses were specially coated with a clear material that allowed the invisible light to be “seen” thus revealing an almost daylight-like view even thousands of feet below the ocean surface.

“So, this is that?”

“No. Not really,” Tom told his grinning friend. “You see, that system relies on properties of light refraction that only exist in water. Solid water, not rain or something like that, by the way. No, if I have to come up with some sort of receptive coating, it will need to operate in the driest conditions. But, that’s to be seen, no pun intended, once I test this,” he said pointing at his now loaded cart. “Want to help?”

“You bet!”

The two pushed the cart out of the lab and down the hall to the elevators. Once in the basement, they wheeled the cart and its contents down to the far end of the building and into the large atmospheric test chamber.

Once again, Tom opened the computer program that would control the swirling winds and the additions of different dusts, dirt, and fuzz that would simulate the New Mexican storms.

As soon as it had been called up and Tom had made a few fine adjustments to the settings, he and Bud connected the three leads from his breadboard circuits to the sealed passthrough connection points and therefor to the controlling computer, then they wheeled the cart into the small, sealable protective box and then closed everything up.

With the inventor sitting at the computer and his friend standing behind his left shoulder, the first sequence began. At first, nothing was to be seen, but once the initial bits of dust and dirt were introduced, both boys could see it swirling madly around the semi-circular chamber. In minutes there was so much flying debris that they could no longer discern anything more than an inch or two inside the clear Tomasite walls.

The monitor being fed by the inside camera showed the same thing they had watched days before—nothing by a mass of brown-gray.

“Here goes,” Tom stated as he pressed a button. Immediately, there was a change. And, though it was small, both boys let out a cheer as they found they could see the first stationary marker that was bolted to the floor three feet in front of the camera. The image was still murky and fluctuated with the amount of materials swirling in between the two points, but they could see it.

“Skipper! You did it!” Bud said as he patted Tom heartily on the back.

“Not so fast, flyboy,” Tom responded, a look of consternation crossing his face. “It’s something, I’ll admit that, but it is a long way from what I had hoped to see. Let’s try a few different settings.” So saying, he called up a new part of the program

and set it so that the lightwaves would slowly change from the lowest, near-daylight, waves up to the highest possible with this equipment.

As it ran, they watched the monitor, occasionally glancing up at the wall of the chamber. To both boys’ amazement, there were three distinct times when they believed they could easily see to the far side of the chamber and clearly discern the farthest visual target a full forty-eight feet from the camera.

By the end of the fifteen minute test, Tom was beaming. “We did it, Bud!” he exclaimed, as he ran a brief series of calculation on his tablet computer. “I figure that using one or even two of those light ranges that gave us good vision inside the storm ought to be sufficient.”

“Yeah,” said Bud, very happy for his friend, “but what do you do with it now?”

Tom sat back, his fingers steepled in front of his mouth. “Well,” he began slowly, “assuming that I can get either filters or induce the plasma to give us the right wavelengths for those lights, and put it all into my plasma headlamps, then I believe that Enterprises can begin producing units that can be sold, first to emergency organizations like the fire and rescue units out there. Police, too. Then, as we get the price down, they could get affordable for the average citizen. Plus...” He stopped suddenly getting a look of curiosity. “I need to test something else!” he declared.

While Tom had been talking, the chamber had cleared and automatic vacuuming systems were in the process of cleaning out the floor and the inside of the dome. Once that was finished, he started a new test.

Bud had taken a seat and together they watched as the chamber filled with a thick fog. As before, it became so dense that neither boy could see the opposite side of the chamber. In

fact, it finally became so thick that they couldn't see the first marker just a few feet away.

"That's pretty thick fog, skipper," Bud told him. "I mean, is that even possible in real life?"

Tom grinned. "Yes it is. There are a few places up in the Pacific Northwest that have towns and small cities located down inside what amounts to a bowl, totally surrounded by hills and mountains. The fog rolls in in the winter time and can get trapped there. It has ben known to be so thick that they often just shut everything down except hospitals and police services."

"Wait. Are you saying it gets too thick for someone like Sandy to go out shopping?" Bud asked, mirroring Tom's grin.

The inventor nodded. "All stores closed, even to people as determined as my sister! I'm hoping that we can cut through some of that fog with these same lights. Normal fog lamps use an orange or yellow filter and lower intensity lights to help you see ahead. If you try using regular headlights, especially on high beams, you get a reflection a little like our first test the other day."

He began the tests again. Only a single wavelength of light seemed to adequately penetrate the thick watery vapor. To Tom's delight, it was one of the same wavelengths that had been successful at piercing the dust storm.

While the fog was being withdrawn by strong fans, and an automatic armature began to squeegee all of the collected moisture from the inside of the chamber, Tom prepared for his final test.

"What's up for the finale, Tom?" Bud asked, now with a full understanding of the momentous nature of his friend's discovery.

"Just good old wood smoke, Bud. Like you'd find in a forest fire situation."

Bud nodded in thought. Being from California, he was very aware of the dangers from forest blazes, and how difficult it was for fire fighting crews to get into some areas where they ran into smokey conditions that made it darker than night time, even at high noon.

Fifteen minutes later, they both had huge smiles on their faces.

Although the magic wavelength for smoke had been slightly lower than the second successful dust test one, Tom now had a pair of light sources he could build into his amazingly bright plasma headlights.

\* \* \* \* \*

Three weeks later, Tom and Bud hurried to the *Sky Queen*. The giant aircraft had been sitting on the tarmac on standby for ten days, waiting.

As Tom sent her skyward, Bud inquired, "Where are we heading?"

"Out to Arizona, Bud. We've been waiting for an opportunity to test the new plasma headlights in the real world. Well, we just received word that there is a really big dust storm making its way across the lower half of the state, heading right for Phoenix. Reported visibility is under two feet."

They flew at Mach 2, technically not normally permissible over the U.S. but allowable in cases of emergency. And, Senator Quintana from Arizona had secured emergency status for their flight. To keep any resulting sonic booms minimized, Tom took the *Queen* up to 65,00 feet where the air was not dense enough to build up in front of the aerodynamically-perfect *Queen's* nose.

By the time they arrived at Phoenix's airport, the storm was just five miles away and approaching at about ten miles per hour.

At almost five thousand feet high, it looked to Bud like an approaching mountain and not a storm.

The airport had already been shut down so Tom was readily given permission to drive his specially-outfitted test truck onto the main runway.

Tom and Bud sat, securely strapped in just in case the storm flipped the heavy truck they had wheeled out of the Queen's hangar, at the far western end of the runway, and they watched the billowing storm approach. A minute later it reached the eastern end of the runway and then was quickly upon them.

"Here goes!" Tom said, putting the truck in gear.

They began inching forward, neither one able to see more than the occasional glimpse of the nose of the truck's hood. Small rocks pelted the truck first nicking and then cracking both the windshield and the side window next to Bud. Both held although they undulated with the throbbing winds. Bud grabbed a roll of tape from the toolbox and ran several layers in an "X" pattern on his window before taping a rectangle with a center, horizontal stripe, around the edge of the windshield.

"That ought to hold it for a little," he told Tom.

Tom reached out and flipped the headlights on. "I've had to put two different light filters and two plasma lights in each headlamp so we can use one or the other or even both for best visibility," he explained.

They tried first one, and then the other and finally a combination of both wavelengths.

Later, Tom told his father that he wasn't quite sure why neither of them expected to see what they did, but the effect of

the new lights was immediate and dramatic. Not perfect—but Tom never expected it to be—the bright light shot out and illuminated an area at least one hundred feet in front of them. This was easily enough light for him to drive the truck straight down the center of the runway at sixty miles per hour and to have enough time to dodge the occasional tumbleweed or chunk of broken cactus that came at them.

But what amazed him was that there was no bright reflection from anything.

They turned around at the far end of the runway and drove quickly back toward the waiting *Sky Queen* and the terminal.

An hour later, the storm passed on and cleanup began. Tom and Bud sat in the Airport Manager's office sipping coffee and discussing their test with the man.

"That's absolutely amazing," he was saying as they watched the video Tom had taken during the test. "If I wasn't seeing it with my own eyes, I wouldn't believe it! But, there you are. Amazing! Sign us up for some of those, please!"

Once the airport opened back up, Tom and Bud took off, heading for The Citadel where they had arranged for the local fire and rescue Chief to meet them.

His response was unexpected. As he watched the Phoenix footage, tears began streaming down his face. Turning to face Tom once the video was over, he wiped the remaining ones away and said, "Every year we have about two hundred people die during dust storms, Tom. Two hundred! Most of them are from chain accidents where people drive right into an accident in front of them without ever seeing it. Some die immediately, but at least seventy percent are folks who die simply because we can't get to them. You can't imagine how this is going to save those lives!"

Tom, recalling how the young man had almost died, just



yards away without the inventor being aware of his plight, was suddenly too choked up to respond.

Seeing this, Bud spoke up, "Oh, Chief Tompkins, I'm pretty sure Tom understands."