

TOM SWIFT
And The
Transcontinental
BulleTrain

BY

Victor Appleton II

Technical Editing: Greg Hall

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Swift Enterprises wins part of a governmental contract to provide high-speed (150 mph+) freight train service between just east of Los Angeles and the greater New York City area. The contract comes with an unrealistic schedule, an unknown set of partners, and someone in the Department of Transportation out to do the Swifts financial harm.

Tom's approach would be to construct a tunnel under the entire continent linking the two cities. His main rivals during the bidding phase each promoted above ground railways, one who plans to build by leasing Tom's own Repelatron Skyway equipment.

He runs afoul of two of these one-time competitors, and faces issues of underground stability. Can Tom develop methods for creating a tunnel that is both stable and flexible? Will his enemies find ways to discredit him? Or, will his new transcontinental railway system be a success.

Tom's reputation and Swift Enterprises future may hang in the balance.

This book is dedicated to the nameless, faceless individuals, mostly indentured Chinese from the west and underpaid Irish from the east, who built the nation's first transcontinental railroad. Many of them died during the build and were placed in shallow graves in the middle of nowhere. I grieve for your spirits. Be at peace. Your efforts and sacrifices made a difference. I'm just not certain if it all is ending up for the better.....



Tom moved the lights around and could immediately see that they were in trouble. The cavern extended farther up and down than their powerful spot lights could reach. **PAGE 158**

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AUTHOR’S NOTE:

Wow. Three books down and I now have a list of at least five more to write. I am beginning to see a pattern, too. My Tom stories seem to have a bit more ecology to them than any other series or individual book. And, I suppose this is not a bad thing.

I am also seeing that Tom is maturing and his relationship with Bashalli is progressing nicely. My hope is the Tom purists don’t see this as a betrayal of trust. I mean, at least I don’t have these books full of angst-riddled teen vampires, slightly fey werewolves with anger issues or child wizards. I’m not that far out!

I am also learning that no matter how many different word processing or page layout programs I run these through, and even after a fourth read through, I still find the occasional typo or spot where “auto correct” has sabotaged what I actually typed in. If you do spot a problem, I ask that you understand that in this modern world of self-publishing there is no such thing as an editorial team checking each comma, period and semi-colon for you. Ditto there being no painstaking search to find errors.

I want to thank those of you who have searched out and purchased my first two novels. Even if it had only been a single copy—but it has been more than that!—it is gratifying to see that there are others out there who want more Tom Swift. As I said, I now have eight on my list, so there are at least five more after this.

Quality paperbound copies of all of this author’s works may be found at the following web address:

<http://www.lulu.com/spotlight/tedwardfoxatyahoodotcom>



Tom Swift and His Tectonic Interrupter

FOREWORD

One of the earliest large-scale engineering projects undertaken in the United States was the transcontinental railroad, a project that finally united both coasts of this great nation. With it came progress, prosperity, the almost total death of the American bison, disease and human tragedy.

Today, it is remembered for connecting east to west. Nobody talks much about it. School kids probably have no idea where the 'golden' spike was driven. My nephew once said it was, "Apple Matrix Courthouse... or Chicago, some place... right?" Oh, my dear, sainted aunt!

And, practically nobody is utilizing thousands of miles of tracks that once were the only connecting point between towns and cities. Some tracks that *are* in use should be declared unsafe. Pity. It's part of our nation's history.

As the population has demanded faster and faster gratification, the railroads haven't been able to keep pace. Huge, ponderous diesel-electric locomotives are fairly efficient on a cost-per-mile basis, but can still take a week or more to cross the nation with all the stops they need to make... *to make money!*

I was astounded when Tom and Damon were asked to help revitalize this once-proud method of transportation. And, I was pretty near dumbfounded when I heard just how they wanted to do it.

All I can say is that it was a true pleasure to chronicle this Swift Enterprises project. Enjoy!

Victor Appleton II

CHAPTER 1 /

THE LITTLE ONE THAT COULD

“WOW, TOM,” exclaimed Bud Barclay, young friend of Tom Swift the famous inventor. “This new engine of yours puts out more power than anything I’ve ever driven!”

Blond haired, blue-eyed Tom replied, “I’m glad you approve. It’s something I started working on back when I was in junior high. It just took me until now to get it built.”

The two best friends were standing next to a low-slung sports car parked next to a test track at Swift Enterprises, the sprawling four-mile-square experimental facility near Shopton, New York, where Tom, his father Damon Swift, and their employees designed and manufactured all of the magnificent inventions for which they had become rightfully famous.

Bud asked Tom to go over all of the details of the new engine. “You still haven’t let me look at it, Tom,” he chided his friend. “I’m not smart enough to steal any secrets, so why are you keeping the actual engine under wraps?”

After taking a pause and a deep breath, Tom’s reply startled him. “Because it is too good to be true.”

“What do you mean?”

“Well, let’s say that I have never met you before and I tell you I have a perpetual motion machine. You’re going to be skeptical at the very least and angry at me for wasting your time at worst.”

“Yeah. I guess. So?”

“So, this engine has nothing about it that would lead anybody to believe that it does what it does. Until I can come up with a really solid reason why it works so well, and one that can be explained in under thirty seconds, I’m keeping mum about it, and that goes for letting anybody other than the small group of engineers that built it even see it!”

Tom hopped behind the wheel and Bud lowered himself into the passenger seat.

“Can you at least tell me a little about the basic design? Nothing with too many multi-syllable words for my little brain to handle,” Bud requested.

“Let’s get back to the lab and get this car under lock and key. Then, I might tell you a little story,” Tom replied teasingly.

Once Tom had rolled the car into its storage garage next to The Barn—the large, open ended building used to construct many of Tom’s larger prototype and test models of his fabulous inventions—he and Bud walked over to the Administration building and the office he shared with his father.

“Okay. Spill if you please,” Bud requested as they settled into a pair of oversized leather chairs.

Tom rubbed his chin as he thought about how to begin. Finally, he looked at Bud and said, “You remember Mrs. Trunbridge? My favorite teacher back in junior high?”

“Sure. You told me that she used to call you Tommy no matter how many times you asked her to call you Tom. Nice lady.” He grinned at Tom.

“It was in her class that the concept for my new engine developed. It wasn’t until I bumped into her a few months back that it all came back to me.”

Bud remembered how Tom had suddenly jumped up in a local café when an idea had struck him. His jumping and shout of, “Yes,” had startled the woman at the next table so much that she had spilled her iced tea over her blouse. The woman turned out to be his now retired teacher.

“How does it work?” he inquired.

“Well, first let me show you the basic layout.” Tom picked up a notepad from the table in front of them and took out one of his ever-present mechanical pencils. Soon, he had sketched an object that looked like a chubby upside-down letter Y.

“This is the overall shape. Each of the arms—three of them—is actually a 4-cylinder engine.”

“So, I was driving a 12-cylinder car?” Bud asked.

“Exactly. But this one isn’t like any other large engine in that class. Because of the layout, each cylinder can be connected to the central crankshaft at smaller degrees of separation. Each piston drives up and down at only a slightly different cycle.”

“What does that mean in simple talk?”

“It means that by careful setting of the piston positions, it is possible to always have more than one piston driving down in its power stroke and perfectly balanced by another piston in one of the other arms. Unlike typical engines that have to overcome a lot of unpowered glide time between detonations, in this one the crankshaft is constantly under direct power at any point in time.”

“And that’s what makes for the tremendous power. Right?”

“Sure. But that’s not all. How large of an engine would you say you were driving, Bud?”

“Let’s see. My convertible has a three point eight liter V-6 and this one outclassed that by... well, by more than I can figure. Okay. I guess that this must be at least a five-liter V-8 engine. Close?”

“Off by a factor of ten,” Tom said looking straight into Bud’s eyes.

Bud grinned. “You’re joshing me, right? I mean, it can’t be a fifty-liter engine. That isn’t even possible in a car that size.”

Tom shook his head. “No. It has a half-liter engine. Each of the pistons is just about forty-two cc in size. About what you’d see in a small chain saw.”

Bud looked at his friend with skepticism written all over his face, stuck out one leg and said, “Pull the other one, professor. If you’re not going to tell me the real story then you must really want to keep this thing under wraps!”

Smiling, Tom rose and went over to a side table. He returned carrying an object covered by a black cloth. He set it on the table in front of his friend. Whisking the cloth aside, he pointed at the device. It looked very similar to the drawing on the pad next to it.

Bud gasped. “You can’t be serious,” he said. “This is a one-fourth size model or something. Isn’t it?”

“Nope. Full size.” Tom declared. “One of Arv’s models.” The inverted Y shaped engine was only about twelve inches long and fifteen inches tall. Spark plug-type wires went from a small box attached to one end and disappeared into four locations on each arm.

“These,” Tom said pointing at the wires, “power a mini version of our spark ring. The one we use in our hybrid diesel/ethanol engines. They produce a more complete burn of the fuel. That’s where we get some of the power.”

“Using some new super fuel, I’ll bet.”

“Again, nope. Plain old gasoline. Not even premium grade. And, it’ll get about seventy-two miles per gallon. Now you can see how difficult it is going to be to make a simple announcement about the Y-4 engine and have anybody believe us.”

Tom pointed out several of the features of the engine including its miniaturized fuel injection system. He also told his friend about his plans for a possible conversion kit allowing the Y-4 to replace many large engines currently in use in full-sized sedans

and coupes. “Just connect the proper transmission adapter and new engine mounts and off you go,” he told the still-awed Bud.

“There’s one other thing,” Tom added after all of Bud’s questions had been answered. “Take a guess at the total horse power coming out of the engine.”

Bud thought for a minute, then said, “This sounds like a trick question. For the speed and power it gives that test car I guess better than 300 HP. But, knowing you and now knowing how small this is I guess it could also be about 30 HP. Am I close with either one?”

Tom laughed. “You’re closer with the second guess. It actually puts out about 70 HP, but it’s the tremendous torque that is the secret. The perfect setting of piston positions and the constant level of power mean two things. We get a torque rating of over 380 foot pounds, and the engine doesn’t need a heavy flywheel to keep it turning when the pistons are in their glide strokes.”

“Okay. It isn’t that I don’t trust you with my life, Tom,” Bud stated, recalling how many times that had been the case, “but could I take a little peek under the actual hood of the test car. You know... just to be sure you’re not spreading it on a little thick?”

They left the building and returned to the special garage. Tom beamed his electronic key at the lock and they entered the structure. Opening the hood, Tom said, “Voilà!”

“Well, I’ll be,” declared Bud as he stared down to a shiny metal version of the Y-4 engine he had just seen in Tom’s office. “You weren’t funnin’ me after all. Color me impressed. Very, very impressed. Listen. I’ll testify at any announcement for you. This little power pony is the real thing!”

Tom closed the hood and they departed the garage with Bud hopping into one of the electric micro cars that Swift Enterprises employees used to get around the massive facility. He told the young inventor that he was heading out for a test flight of one of the Swift executive jets that had just come off the line.

As with all Swift aircraft, a thorough twenty-hour series of test flights and systems checks was performed before any customer could take delivery. In this way, they generally discovered any small defects or issues and were able to completely fix them before the customer took possession.

Tom walked back to his shared office arriving just after his father had settled into his desk chair.

Looking up, the older inventor—a man looking so similar to his son that at first glance they might be older and younger brothers

—asked Tom, “How did Bud like the new super car?”

Sighing and dropping into one of the comfortable chairs in the office, Tom said, “Like the other people who have seen and driven it with the new engine, he couldn’t believe it until I pulled out the model and then we had to go back out to the car to see the actual engine. I need to come up with some sort of stunt or something to help introduce the engine to the world. I don’t want to get us in the position of having to hand-hold each and every potential customer.”

“I agree. What do you think you might do?”

“Well,” Tom started and then paused. Rubbing his jaw for a moment, he brightened and began again. “One thought has occurred. What if I create a special mount in the test car and also on the engine? Something designed so that I could practically snap the engine in place and drive away.”

“That sounds like the beginnings of the solution, but you would still need to devise a way to demonstrate the enormous power potential. And,” Mr. Swift added, “show the tremendous fuel savings.”

“You’re right, Dad. I’ll come up with something. I just know I need a day or so of solid think time.”

He got up and wandered over to his own desk and sat down. Soon, Tom was lost in thought. He barely registered that the phone on his father’s desk was ringing. The older inventor picked up the receiver. “Yes, Trent?”

The super efficient secretary both Swifts shared, Munford Trent, announced an incoming call from Washington, DC. “It’s from the Secretary of Transportation, Mr. Swift. Jonas Markham.”

“I’ll take it on line five, please.” Tom looked over at his father as the phone buzzed announcing the connection. “Damon Swift here.”

He listened for a moment and then asked, “May I place this call on speakerphone, sir? I’d like Tom to get in on this.” The answer was evidently positive so Damon pressed a button and set the receiver back on the hook.

“We’re both here now, Mr. Secretary.”

“Good,” came the deep, booming voice of the recently appointed man in charge of the nation’s transportation systems. “Glad to have you in on this, Tom.”

“A pleasure, sir,” Tom said as he came over to the desk. “What

can we do for you?"

"As you both know, the country's infrastructure is old. We've had some disasters like the freeway bridge that fell to pieces during commute a few years back. Freeways, bridges and even our national rail system are all in desperate need of overhaul."

Both Swifts agreed that there were many problems.

"Chief among my priorities today is getting the nation back to where we can ship goods across the nation at high speeds and very low costs. The current rail system can't sustain high-speed trains. Too many issues with track repairs plus the need to work around passenger trains. Also, far too many stops between point A and point B. Still the least expensive way to ship, but with ever-increasing problems."

"We recently took a train trip down to Washington. Even from here in Northern New York there were more than a half-dozen stops or slow-downs, and that was on a supposed non-stop train into Manhattan," Damon offered.

"Right," the Transportation man said. "What I want to do is create a cross-country, high-speed rail corridor. Absolutely no stops between the terminal in California and the terminal in New York. Or possibly Virginia. We're looking to see where the best place to build a transfer depot would be to cover the entire east coast."

"That's a huge undertaking, sir," Damon stated. "How may we be of service?"

Clearing his throat, the Secretary began, "Tomorrow morning at precisely 9:00 a.m. Eastern time, a request for proposal and bid document will be transmitted to the top ten industrial companies in the U.S. and Canada. Pardon me if it sounds like I'm reading from a prepared statement; I am. Anyway," he cleared his throat, "... the purpose of the bids are to provide for the construction of a non-stop railway and specialty trains to run on said railway stretching from a terminal to be constructed thirty miles south and seventy miles east of San Jose, California and running to another terminal in a location to either be near Roanoke, Virginia or Binghamton, New York, actual site to be determined. Said trains to be capable of a sustained two hundred mph and must be able to make the entire route without need for refueling. That," he said obviously finished reading the statement, "is about the size of it."

Damon looked at Tom. They both shrugged and then nodded toward each other.

"Swift Enterprises will be happy to receive and respond to the

bid, Mr. Secretary. How long will we have to make a preliminary study and provide you with our proposal?”

“Well,” muttered the politician, “that’s where this all gets rather tricky. You know that I’ve come into my position near the middle of the President’s term of office. My predecessor left office officially to pursue private life, but he actually left—and I’m telling you this with the understanding that it goes nowhere beyond your office walls—because the President and Senate are insisting on a real slam-bang-success project to be completed before it’s time to run for reelection. He wasn’t able to commit to that.”

Mr. Swift acknowledged how this frequently occurred. “My question stands, Mr. Secretary. What is the timing?”

“We need to have proposals returned within three weeks and the project must be guaranteed for completion within twelve months after that. Now don’t nag at me for more than that, Damon. We’ve known each other for more years than either of us probably care to mention. As it stands, we may need to break up the project across four or even five companies in order to make the schedule. Sorry, but that’s the way it might go.”

They discussed a few additional details and the Swifts agreed to take a look at the proposal. “We can’t make any guarantees, Jonas. We may end up only bidding on the actual trains. Would that be allowed?”

The Secretary stated that it would be allowed but would not be the most advantageous to any company. The government really wanted this to be a one or two company project.

After the call, Tom and his father sat in silence for a few minutes. Finally, Tom said, “Guess we’ll have to wait to see the actual specifications before we can even talk about this.”

His father agreed.

“I really hate to think I’ll be stuck on a project for that amount of time,” Tom said.

Damon replied, “My guess is that you will get things started and then back out while all of the digging and flattening and building work progresses. That will leave you with ample time to head off on other projects for quite a while.”

The following morning a package arrived via one of the national overnight delivery services and was immediately taken to the Swifts’ office.

“Package for you two,” their secretary and chief assistant said opening the door.

“Thanks, Trent,” Damon Swift replied taking the large envelope and opening it.

He and Tom spent the next three hours reading through the specifications thoroughly, even rereading several portions to ensure they fully understood the project.

Part way through, they were interrupted by Chow bringing them a lunch of grilled chicken sandwiches, macaroni salad, and fresh-squeezed lemonade.

“Eat up, buckaroos,” he brayed at them. Charles “Chow” Winkler was a former Texas ranch cook who had met up with the Swifts several years earlier while they were in New Mexico building the Citadel.

He had been so taken with the then sixteen-year-old Tom that he had practically begged to be allowed to haul up stakes and move to Shopton. He had become the executive chef for Enterprises and acted as personal chef for Tom, Damon and a number of senior employees.

Chow also accompanied Tom on many of his adventures.

The two men ate in relative silence while each continued to read portions of the bid request.

With a little whistle, Tom said, “It looks like the actual trains and cars would be a snap for Enterprises to build. One or two of our midget atomic power modules could provide enough power for each engine’s electrical motors and the number of engines could be determined by the freight load.”

“Certainly,” replied the elder Swift. “But the job of manufacturing almost three thousand miles of track, preparing the road bed, hauling the materials and installing them will be tremendous! I’m not sure I see any way even a trio or foursome of companies could effectively split up this project and bring it to successful conclusion in the very short time allowed.”

“Tomorrow,” Tom stated, “I’m going to take the *Sky Queen* on a cross country run to scout out a possible route. I have the feeling that there are going to be more than one or two cities that will need to be skirted.”

Mr. Swift agreed to the trip. He would need a lift to the Citadel in the morning so he asked whether Tom would take a slight detour and drop him off.

“Sure, Dad. I planned on making a few cross-country runs to check out different route possibilities. New Mexico should be on one of them; I’ll just make it the first one!”

The next morning the Flying Lab soared skyward on her new Repelatron lifters. In order to lessen Swift Enterprises' carbon footprint, Tom had decided to replace the fiery jet blast-inducing lifters on the *Sky Queen* and on several of the Swift cargo jets with an array of Repelatrons. In the *Sky Queen's* case, this meant tapping into the huge solar array on the upper fuselage. For the other jets, Tom had both a Swift miniature atomic power supply installed as well as a bank of high-capacity solar batteries.

Tom had asked that a high definition video camera be mounted in a small clear blister on the bottom of the giant jet so that he could replay the scenes later. This would allow him to concentrate on flying.

Soon after dropping his father off at the Citadel, the Swifts sprawling nuclear generating and experimental station in the north western desert of New Mexico, Tom was aloft again and heading for California's Central Valley and the small town of Madera, site of the proposed western terminal.

He zig-zagged the country getting video surveys of three possible routes between east and west points. As he had first believed, almost no route would allow for a totally straight rail line. He already understood the lengthy areas of mountain to overcome in the west. But his biggest surprise, and concern, was the amazing number of existing rail tracks, country roads, streets, highways, private farms and freeways that would have to be negotiated.

That didn't even consider more than fifty rivers and streams that would need to be traversed.

Upon arrival back at Enterprises he sat down with a calculator and a U.S. map. He laid a ruler down over a completely direct route and began counting such obstacles then computed the costs of creating overpasses.

After an hour he sat back and looked at the total. Even using his Repelatron Skyway technology to quickly erect a rail bed over each, the figures were astronomical. More than three hundred points to be surmounted or dug under.

Tom immediately called his father in New Mexico and described the problems.

Mr. Swift waited until Tom had finished and then said, "It's as bad as I feared. Any company attempting such a project will have to seriously underbid in order to even get the project. Then, they will probably end up *in financial ruin!*"

CHAPTER 2 /

“WE REGRET TO INFORM...”

TOM LET OUT a sad hum. “Well, it’s a sure bet that we’re not the only company that will pass on this one. I wonder if they will get any bids?”

“Or, at least bids with realistic numbers,” his father replied. He excused himself for a dinner meeting and hung up.

Tom looked at his watch and decided to head home. For once it would be at a reasonable hour, assuming eight o’clock was a reasonable time. “Mom will sure be shocked,” he said to himself as he headed down the hall.

Anne Swift, petite and attractive mother to both Tom and his teen sister, Sandy, was indeed surprised. Trained as a molecular biologist, she had gladly given up her chosen field to be wife and mother to the Swifts. Her only wish was that her ‘men’ and her daughter hadn’t all turned out to be such adventurers, often getting themselves into dangerous situations.

She tried not to show it, but they knew that she especially fretted whenever Tom or his father went off on some project or when any of them were testing new devices and aircraft.

Tom and Sandy had a fairly simple dinner with their mother talking about Sandy’s latest school project and finally settling into a discussion of the railroad project.

“Why can’t they just upgrade the current rail system?” Sandy asked.

“For starters, very little of the current one hundred forty thousand miles of tracks used by freight trains is in any condition to support a high-speed train. Old wooden ties would have to be replaced by stable and strong high-stress concrete ones and most of the rails would need to be replaced and welded into one continuous rail all the way across the country.”

Mrs. Swift asked, “Wouldn’t that still be less expensive than building from scratch?”

“I wish it were, Mom. Here are the three other big problems. First, the underlying roadbed can’t support the stresses and forces it would be subjected to. Even that could be replaced. Number two is the tough nut. Where do you run all of the freight trains that use those tracks?”

Neither Mrs. Swift nor Sandy had an answer for that.

“What’s the third?” Sandy wanted to know.

“The toughest one of them all. Cities. How do you run a train at, oh, one hundred and eighty or even two hundred miles per hour on tracks that frequently run right through the middle of the city? That brings major safety headaches that I don’t think anyone can overcome.”

Sandy and her mother looked at one another, then at Tom. Sandy murmured, “Oh.”

“So, you see the difficulties. The only real way is to start from scratch, but there you really start to have a whole new set of issues.”

Tom described the headaches of crossing or skirting the nation’s roadway systems as well as rivers, stream, mountains and towns. When he brought up the subject of purchasing the right-of-way, Sandy raised her hands in surrender.

“I give! It all sounds like a pipe dream that will never work.”

The doorbell rang.

Tom looked at Sandy. It would be someone they knew because family and close friends wore tiny deactivating coils hidden in their wristwatches. Otherwise, anybody entering the perimeter of the house set off both an alarm as well as activating a light and video system.

Tom jumped up saying, “I’ll get it.” He opened the door and was pleased to see a beautiful, dark-haired, dark-eyed girl standing there. She stepped forward and gave Tom a quick kiss on his cheek.

“Good evening, Tom,” she said walking past him and into the living room.

Puzzled, Tom closed the door and followed her. She was already seated on the floor next to Sandy and they were soon whispering into each other’s ears. After a minute, Sandy looked at her brother and then whispered something else to her friend.

When they both rose and headed up to Sandy’s room Tom called out, “Happy to see you, Bash.” The girl, Bashalli Prandit, had been born in Pakistan but now lived with her father, mother and older brother in Shopton. She frequently worked at her brother’s coffee shop, The Glass Cat, when not attending a local art college.

She had met Tom months earlier and was now his favorite date as well as his de facto girlfriend. Bashalli had accompanied the Swifts on several of their adventures and was considered almost a

part of the Swift family.

Tom looked at his mother for any sign of support. She simply raised an eyebrow, smiled and then pretended to go back to reading the newspaper in her hands.

“You know,” she said from behind section one of the Shopton Journal, “Bashalli doesn’t always come here to see you. She and Sandy *are* best friends.”

Tom gave up and went up to his room.

Twenty minutes later he heard a soft knock on his door. “You decent?” Sandy asked.

“Come on in,” Tom replied. The door opened and his sister peeked in just to make sure it was okay to enter.

“Bashi and I want to ask a favor.” She bit her lower lip, a sure sign that she felt she might be asking for too much.

“Ask away. I can always say no,” Tom looked at Bashalli who also had a pensive look on her face. She stayed slightly behind Sandy and tried to smile at Tom.

“Bashi and I wanted to know if we could throw a big party at Enterprises... in your underground hangar, to be precise.”

“You see, Tom,” Bashalli added before Tom could speak, moving around so that she stood next to Sandy, “It is coming time for a couple of graduations. Sandra will be finishing high school at the end of this month and I complete my art school training a few days later.”

Tom smiled inwardly. He and Bud had been wondering what they could do to celebrate these two occasions. Outwardly, he seemed to ponder the issue.

“Well,” he began, slowly. “There’s the security angle... and the whole ‘need to move the *Sky Queen* out’ thing... and then there’s —”

“Tom Swift. Stop it!” Sandy huffed and put her hands on her hips.

Laughing, Tom got up from his desk chair and approached the girls. “Sure. Bud and I want to have a big to-do anyway. This is perfect.”

He was immediately rewarded with simultaneous kisses on his cheeks and a very nice hug from Bash. He returned the hug, saying, “I’m a little serious about the security angle, San. I’ll need to get your invite list as soon as possible and have Harlan go over it.”

Sandy said that she understood. She knew that Harlan Ames, Enterprises top security man, always kept on top of who could and who should not be granted entrance to the complex.

“Love ya, Bro,” Sandy said as she walked out his door.

Bashalli turned to him, hesitating slightly before saying, “And, I love you, Tom.” She turned red under her dark complexion and quickly exited the room.

Tom called Bud and told him of the forthcoming party. “That’s great, skipper. It gets that weight off our shoulders.”

The next morning Tom walked into the shared office. “Good morning, Dad,” he greeted his father who had left for work early enough to take care of an international call.

“Good morning, Son. You look like you had a good night.”

Tom told him about the party, asking, “It is alright with you, isn’t it?”

“Of course. Just make sure Harlan gets the invitation list.” Tom assured him that matter was already being handled.

“Have you given any further consideration to the railroad proposal?” he asked his son.

“Sort of. The only thing I could come up with for Enterprises is to try to bid on the actual train engines and the freight cars. I’m sure that we could excel with those, and would probably have a really good chance at getting the contract.”

They discussed several of the aspects of undertaking such a proposal. While Swift Enterprises was known the world around for the quality and ingenuity of its products, and had undertaken numerous government projects that included both aerospace and outer space vehicles, the only true terrestrial transportation projects they had complete did not include trains.

Tom said, “I can’t see any practical way of getting up and over every obstacle, mountain, road, stream and the like. The surface is just too crowded now.”

“Okay, what are the options?”

“Underground.” The word popped out of Tom’s mouth as if it were the only thing he had considered, but both inventors knew that a lot of thought had already gone through Tom’s mind before coming up with this suggestion.

Damon Swift looked directly into his son’s eyes. “You are serious about that, aren’t you? Have you calculated how long it would take?”

“It depends on the speed we can dig. Traditional tunnel boring machines work at rates of a few dozen feet a day. Whoever got the tunneling project would need to use something that could manage miles a day.”

His father asked him for some computations on what it might entail. “What about with tunnel boring machines currently available?”

Tom grabbed a calculator. After punching in a few numbers, he looked up. “That means that even with six TBMs working around the clock, it would take more than two hundred and thirty years to complete the tunnels. I’d suggest more, but there are only eight in existence and at least two of those are deep in the mountains of Central China.”

They both sat back and pondered this fact. Finally, Damon broke the silence. “That really makes an underground approach—with the possible exception of only going through the Sierras and the Rockies—practically untenable.”

A thought occurred to Tom.

“We know that our earth blasters can dig at a rate of almost four miles a day, right?” His father nodded. “So...” Tom picked up the calculator again. “If we assume twenty nine hundred miles divided by four miles a day, I show that a group of, let’s say, six TBMs outfitted with earth blasters, could do the entire thing in...” Tom scowled at the figure he came up with and reran the calculation. It came out the same. “It could be finished in under five months!”

“Would that get you a tunnel wide enough for two trains to pass? If your computations are for a single train tunnel, you may need to double your numbers,” his father counseled.

Tom thought this over. In truth, he had only used a single-track tunnel as his main consideration. He nodded to his father. “I didn’t even consider more than one train in the tunnel. Sorry.”

“How about our just coming up with a bid for the digging machines and the trains?” Damon asked his son. “Presumably, one or two companies could buy or lease the tunnel borers from us and do the digging work, freeing us to make the locomotives and cars.”

“I’d like to take a few days to come up with some possibilities, if you don’t mind,” Tom suggested to his father. “If I can get a few solid figures together, maybe we can go through them and then I can put the proposal together.”

Damon Swift knew that practically anything Tom set his mind

to would be a success. While he had reservations about the overall project—the specification hadn't mentioned payment for individual contributions until the entire project was complete—he couldn't see any harm in answering the proposal and including payment stipulations.

Tom went to his underground lab and private office to begin researching for the project. He was initially startled at how heavy even the most efficient train engines were.

The heaviest were in the range of 170 to 200 tons. While gearing and torque assisted in allowing them to haul great weights, the truth was that on the average 50-car train, almost 25% of the power and fuel used went into just moving the two to four engines hauling the freight cars.

Although fairly fuel efficient on a per cargo pound basis, they still required enormous amounts of diesel fuel—with at least four refueling stops to go coast to coast—to run their huge internal combustion engines that merely drove high-output electric generators. The actual drive mechanism was an electric motor or sets of electric motors.

Tom computed that any train engine without the bulky diesel engine and fuel loads would be less than half as heavy. Perhaps as light as just 30 tons. Unfortunately, much lighter and the locomotive would not be stable at high speeds.

But, he pondered, how do you take away the thing that generates the electrical power and still move the train?

He did a new series of computations to see how a bank of Swift solar batteries might be used. He hit a dead end when it occurred to him that he would need to understand the total load and drag figures for an entire train before he could come up with anything else.

He picked up the Request For Proposal and spent the remainder of the day reading back through it, making notes as he found important information.

The RFP required that each train—and there would be a total of eight of them, four heading west and four east at any one time—be capable of traveling at speeds necessary to cross the entire continent in under eighteen hours.

“That means,” he told Bud who had come to suggest that they pick up the girls and go get a hamburger, “that the trains need to get up to speed within the first twenty minutes and then maintain an average speed of only 145 miles per hour.”

“I thought you said they needed to run at two hundred,” Bud

mentioned.

Tom reran his computations. “Hmm. The RFP mentions that, but I believe they were figuring on a route that is about eight hundred miles longer than the one I would propose. If we can truly come up with a non-stop track, it still looks as if the average speed needs to be under one hundred fifty or so. Of course, I didn’t allow for the almost ten minutes it takes to carefully slow down the train and bring it into the terminal. I figure that one-fifty to one-fifty-five should be all that is necessary.”

“How long will the track be?” Bud asked.

“Well, if it runs straight like a jet might fly, the terminal to terminal distance should be about twenty eight hundred miles.”

Bud let out a whistle. “Jetz! What happens if it takes longer to get going?”

Tom did a quick series of calculation and showed Bud the results. “For every additional two minutes it takes to speed up and to slow down, the train will just need to run an extra quarter mile per hour. Not much, but if you figure in any potential down time —”

Tom stopped, a look of sudden recognition coming to his face. “Bud! The RFP doesn’t mention anything about what to do with a train that breaks down en route. With four trains running, that means that a train would have to be back to speed in under six hours or be moved off the main track.”

Bud’s eyes went wide as he began to understand the issue. “That means that the trains have to be absolutely quit-proof, or an additional track will need to parallel the main line.”

They sat looking at each other for a couple minutes while Tom gave the matter serious thought. Finally, he said, “I hope that whoever gets the rail project understands that. Otherwise, one problem could tie up the entire system.”

They left the office minutes later to have an enjoyable evening with the girls.

When Bashalli asked Tom what he was working on, he told her about the railway project. At first she seemed to believe that it would be an easy project for Enterprises, but then quickly changed her attitude when Tom brought up the ‘break-down’ issues.

“It sounds like the people in Washington have not completely thought this project through, Tom,” Bashalli said.

Tom agreed. As they sat eating, the conversation turned to the

upcoming party. Both girls had been working on an invitation list with people they wished to attend. After comparing them, they were able to cross off almost half of the total as the names appeared on both of their lists.

When they announced that their current total was about 125 people, Tom mumbled something about it being worse than a wedding invitation list.

The girls seemed to realize that their lists had gotten a little out of control and promised to have the final list at under a hundred guests.

“I called Harlan Ames and he told me that he and Phil Radnor could go through a list that size in about five days,” Sandy told the boys.

Tom agreed that one hundred—including the four of them—would be a good size for a celebratory party. “Be sure to invite Mom and Dad, and Bash’s folks and her brother. They can be above the one hundred. Okay?”

The following morning Tom went back to working on his notes and investigation on the railway RFP. By noon, he felt that he needed his father’s input.

He told the older inventor about his concerns regarding tracks and possible delays or breakdowns. “Should I give a call to Washington and speak with the Secretary of Transportation? Perhaps he hasn’t considered everything.”

Damon Swift thought for a minute. He looked at his son and said, “I’m not too sure that it would be a good idea to bring up problems in their request. Things are so tight, time-wise, that it may throw a monkey wrench into the entire project. I suggest that you put that into your proposal under a separate heading of Concerns.”

Tom agreed and returned to his lab. Over the following three days he completed his research and wrote the first draft of his proposal. He proposed that Swift Enterprises be awarded the contract to provide the engines and the integrated cars as well as a small fleet of tunnel boring machines capable of digging the cross-country tunnel should the government agree that such a tunnel was the only acceptable way of accomplishing the project.

He included the suggestion that all of the tracks be integral to the bottom of the tunnel both for ease of installation as well as stability. As he saw it, only a totally integrated system could hope to provide the constant speed as well as the stability and safety necessary for such a transportation system.

After printing it out, he did a quick review of the fifty-page document and then headed over to show it to his father.

They sat in the comfortable leather chairs in the conference portion of their shared office and, over tea brought to them by their efficient secretary Munford Trent, they poured over page after page.

Damon asked pointed and pertinent questions and Tom answered them or took detailed notes promising to research them and add them to the proposal.

Two hours later, Chow wheeled in a lunch of baked salmon, green salad and poached asparagus. They continued working on the document review as they ate.

By mid afternoon Tom left the office with more than thirty points to research and revise. However, Damon Swift's overall impression had been very positive. He had promised to contact Jake Arturian—Damon's best friend and manager of The Swift Construction Company—to get more detailed cost figures.

The following Tuesday, one day before the due date for the proposals, Tom and his father were contacted by a woman named Sahndal Bjorgman, the third assistant to the Secretary of Transportation.

"Good day to you Mister Swift senior and Mister Swift junior," she had started. Tom was about to correct her when his father silently shook his head.

"What might we do for you and the Secretary, Miss Bjorgman," Damon asked. "We are just finishing up our proposal and you should have it by overnight delivery tomorrow morning."

"Ah," she said hesitating. "We may have a small issue. Let me read you the memo I received from the Secretary just this morning." She cleared her throat and then read:

To Swift Enterprises, Shopton, New York and to Slaker Industries, Denton, Texas. I regret to inform your companies that the project listed under Request For Proposal USTA-9458A-17 is hereby rescinded for both of your companies. You are requested to cease developing proposals for this project immediately. Any proposals received will be returned, unopened. The Department of Transportation apologizes for any inconvenience."

Momentarily speechless, both Swifts stared at the speakerphone. Finally, Mr. Swift found his voice. "May I inquire

as to why we have been summarily cut out of this project?”

“It has been brought to the attention of this office that your company is involved in an illegal attempt to subvert the project. Such action is not tolerated by the DOT. You are hereby dropped from this and *all other Government projects!*”

CHAPTER 3 /

WHAT TO DO?

“MISS BJORGMAN! You must tell us what evidence you have to make such an assertion,” demanded Damon. “There is absolutely no impropriety taking place at Swift Enterprises. None!”

But, it was too late. The phone had gone dead. While Damon began stalking around the office, fuming, Tom opened the door to the outer office and asked Trent to call the office of the Secretary of Transportation.

“Tell his secretary that this is a priority call regarding his rail project. That ought to get you through.” With that, he pulled his head back into the office and closed the door.

A minute later the intercom buzzed. “Your call has been connected, Tom,” Trent told them. Tom pressed the line button and said, “This is Tom Swift. Is this the Secretary, please?”

“Why, yes, Tom. This is Jonas Markham. I’m a little pressed for time, but what can I do for you?”

Tom quickly briefed the politician on their recent phone call.

“That’s an outrage!” Secretary Markham cried. “An absolute outrage. I never gave the order to preclude you. I don’t know where Miss Bjorgman got her information, but I intend on finding out. Under no circumstances are you to consider that Swift Enterprises is anything but held under the highest esteem in my office. Or, the entire U.S. Government for that matter.”

Tom and Damon thanked him. Before hanging up, the Secretary asked, “Are you submitting a proposal? I ask because we’ve already had more than half of the companies opt out of providing proposals. We could *really* use your support and participation.”

Tom told him about the proposal and bid for the trains portion of the project. He also, after looking meaningfully at his father, brought up the matter of the extra rails necessary for safety. “Mostly in the tunnels, sir,” he added, “but probably some sort of lay-by tracks every ten miles or so along the surface part of the route.”

“Ah...well. That’s something that we didn’t consider. Now, you’ve got me hoping that the contenders for the rail portions understand that issue.” He thanked the Swifts and ended the call.

“I hope that doesn’t jeopardize the project, Tom,” his father

said.

Tom showed him the final version of the proposal and bid, including the cost figures Jake Arturian had provided that morning.

After a point-by-point discussion, they agreed that Enterprises might not make much money should the contract be reduced below a total order of five trains, but that the proposed eight train build would bring in a reasonable profit to the company.

They would ask for simple costs of goods for the tunnel boring machines, hoping to gain some profit from the leasing of the machines to one or more of the rail-laying companies.

Tom asked Trent to arrange for the delivery of the document to Washington.

“Will you let me spend some money and get a design team assigned to this before we hear back from the DOT?” Tom asked his father.

“I’d suggest that you not try to build anything right away, son,” Damon told him with a twinkle in his eyes. “You just might have everything finished before the contracts are awarded.”

Tom smiled. “I want to get Hank and his people working on the power plant side of things and another group doing computer simulations on tunnel shapes and sizes compared to various train configurations, and—”

Damon held up a hand. “Too much info, Tom. The answer is yes, but use some caution. You know that Enterprises doesn’t like to spend much on project preparations until we have a contract, so keep whatever you can inside the computers.”

Tom agreed and soon left to speak with Hank Sterling.

Hank had assisted Tom in developing the bid for the project so he was completely familiar with most of the requirements.

“I’ve already done some research, Tom. I’ve been looking at France’s TGV and the Japan Shinkansen Bullet Train and the one running in China. We don’t want to do a direct copy, but they have all done some serious design testing and all have a lot of features in common.”

“I know, Hank. I just want to be sure that we have the best train to run through hundreds of miles of tunnels and then across hundreds and hundreds of miles of open space. A lot of pressure can build up in front of the lead engine in a tunnel.”

Hank requested several weeks to come up with a set of computer designs and test. Tom replied that they would be

hearing back on the bids at just about that same time.

“Everything will be either ‘go’ or ‘no’ at that time,” Tom told him.

Tom spent the following three days doodling on a sketchpad and then inputting design ideas into his computer for a proposed tunnel-boring machine.

By the weekend he had come to the conclusion that it was practically impossible to come up with the actual design until more was known about the trains that would run through the tunnels.

Instead, he contented himself by making a detailed list of the features of such tunnel boring machines, what Swift Enterprises already had that might satisfy them, plus what he would need to invent in order to accomplish everything. He was pleased to find that Enterprises already produced or had at one time produced twenty-three of the twenty-eight major components on his list.

Of course, he pondered, that meant the other five plus countless minor pieces would have to be designed, not only for the overall machine, but to work with ready-made components.

“Sometimes,” he mentioned to his father that evening, “I would rather do everything from scratch than to have to fit existing pieces into the puzzle.”

With a little laugh, Damon replied, “You have my understanding, but no sympathies, Tom. Unless you can come up with new things that will cost us less in the long run—or even the short run—my guess is that Jake will put the dampers on you. We gave him the task of cutting costs overall, and I’m sure that he won’t want to let this one get out of hand.”

Tom smiled, a bit ruefully, but had to agree. He would just need to make things work.

The following Tuesday arrived, complete with a ‘heads-up’ call from the Department of Transportation. Damon was out of the office, so Tom took the call. He took a deep breath, dreading what might come if the caller were Miss Bjorgman. He was still angry about her call.

It turned out to be the Deputy Secretary, Homer Davidson, and someone Tom had dealt with at least twice in the past.

“Deputy Secretary,” he greeted the caller. “This is Tom Swift. How are you today, sir?”

“Pretty good, Tom. How’s your father?”

“Dad is good. He’s out in California right now. Sorry that he

can't be in on this call. What can I do for you?"

Tom heard the caller take a deep breath and felt a momentary fear of what might be coming.

"I know that you and Damon worked hard on your RFP response, and we really appreciate that. We have a problem, however."

Tom tensed, waiting.

"We only ended up with six responses, and one of them was so outrageous that we had to disallow it. Oh, don't worry. It wasn't yours."

"What is wrong, sir?" Tom inquired.

"You are either going to laugh or give me an outright answer of 'no,' but I wanted to tell you that your main opposition for the construction of the locomotives is also bidding to provide the five-mile span over the Mississippi River."

Tom was intrigued, but was not certain why the Transportation Secretary was telling him this. "What is wrong with that? I'm sure that we can provide a superior locomotive and we are not trying to bid on any bridge work."

"The company—I won't give you their name—has based their bridge work on a lease they claim they have with Swift Enterprises for what they call your Repelatron-Lifted Aerial Roadway Technology."

Tom sputtered and choked before he was able to get anything comprehensible out.

"That's preposterous. We have leased that technology to nobody. And I can assure you that we won't."

"That's what I figured. Their bid for that bridge was a bit on the low-ball side anyway. We already informed them that we are going to pass on them for that portion. We don't want to deal with anyone trying to get work piggy-backed on someone else's inventions," the Deputy Secretary assured him. "But they are still in consideration for the locomotive work."

"Good. I can breathe again," Tom told him.

"You can do more than that, Tom. This is an unofficial call to tell you that Swift Enterprises is to be given the contracts for both the tunnel digging equipment—almost exactly as you detailed—plus the design and development of the locomotives."

"And, the transport cars?"

"Well, no. To be honest with you, we have been pressured to

accept a bid from one of our Canadian suppliers. All in the spirit of North American cooperation, or some sort of blather like that. We still want you to design them, but the actual construction will be going to CanPacLant Corporation in Ottawa. Sorry, but the Senate has demanded it; it is out of our hands.”

Tom told the Deputy Secretary that he was disappointed, but realized that there was nothing to do but accept the terms.

“What about the tunnel borers? Will the contract be for the six we suggested?”

“Let me look.” Tom could hear pages being flipped through. “No. From a cost aspect it looks like we are allowing for three.”

Tom gasped. “But, that’s too few. Maybe five, but not three. Sir? All of our computations show that a minimum of five are required to come in with the tunnels finished within the project period. If we can’t build and run five—or better still the six we detailed—then I don’t believe the project can be completed on schedule.”

“Oh, dear. Hmmm? How long... or rather what would be the schedule impact?”

Tom pulled out his calculator and ran figures through it as fast as his fingers could input them. Three minutes later he had his answer.

“For each TBM below the minimum of five, I believe the schedule will be impacted by four point four months. If we are only allowed to build three, that means the tunnels wouldn’t be complete until almost nine months *after* the project is supposed to be completed!”

“Let me run this past the Secretary, Tom. I’ll try to get back to you today, but tomorrow for sure.” With that, he terminated the call, leaving Tom to sit at his desk wondering if Enterprises might be better served to cancel their proposal.

The next morning Tom arrived minutes after his father and was in time to hear the final part of the DOT call back.

“...so, and based on Tom’s figures, we are doing the number crunching to see where we can recoup some costs, but you will be asked to build five of the TBMs. Sorry for the little panic, Damon.”

“That’s okay, Homer. We just want to do this the right way and ensure that the project can be completed as scheduled.”

He gave Tom a thumbs-up sign and said goodbye to the DOT man.

“You heard that, right?”

Tom nodded, relieved. “I think that Bud and I should start mapping out the specific geographic points along the way and see what we might be running into. We’ll spend today heading west and then come back tomorrow.”

“Remember to be back for your dinner with Bashalli, Son. I seem to recall that tomorrow will mark exactly one year ago you two started dating. It’s your first chance to get an anniversary right. Sets a good tone in any relationship.” He smiled, knowingly, at Tom.

Tom grinned and then made a couple calls. Bud agreed to meet him at The Barn in ten minutes. Bashalli was very happy that Tom had remembered and promised to be ready at seven the following evening.

Tom and Bud climbed into a Toad, the strangely-shaped commuter jet featuring a pair of above-wing-mounted jet engines that gave the appearance of bulging eyes, and were soon winging their way toward Binghamton, New York.

“I want to make one more coast to coast flight at relatively slow speed,” he told Bud.

“What are we looking for?”

“We aren’t looking for anything special except to locate anything that might be out of the ordinary. Sudden rock formations, swampy areas, even unexpected canyons. Like that. What will be happening at the same time is that I had the engineers mount a downward-looking Damonscope Mark II. It will look for differences in the underlying soil and rocks as we move along the train’s potential path.”

Tom had developed the original Damonscope to look underground for radioactive deposits. It was great for its intended task, but only where radioactive isotopes were concerned. Tom had updated the ‘scope recently so that it could determine the probable make-up and density of the land beneath it.

When combined with the repelatron lifters in the *Sky Queen*, it allowed the computer to make most of the necessary adjustments in the elements mix to provide optimum lift.

Although only capable of penetrating about fifty feet, Tom was sure that he would gain a much better idea of what they might tunnel through once the Damonscope had given them a printout of this trip.

Everything proceeded quietly for the first two hours. Tom and Bud talked about the girls and the upcoming party for the first

hour. Most of the second hour had passed with Bud telling Tom about several of his most recent delivery trips, and of the actual clients for the different models of Swift aircraft.

Several times he had Tom in convulsions of laughter as he described things.

They unpacked some of the sandwiches Chow had provided for the trip and were soon munching on roast beef and bologna with cheddar cheese.

After lunch, Tom suggested that Bud take a nap. "We won't get to California for another nine hours at this speed, so I'll want you to be bright and awake."

Bud had moved to the back of the jet. He lay out across two seats and was soon lightly snoring.

The Toad progressed along the prospective path for another ninety minutes. Tom took a series of photographs of the ground as it raced by more than 10,000 feet below.

The first indication that anything was amiss came as the aircraft passed over the three state border area of Nebraska, Missouri and Iowa, heading toward the town of Nebraska City. All of the indicators on the touch-panel glass instrument panel in front of him began to go jittery, and then the entire panel went dead.

Tom did a quick check of flight systems and realized that he still had control, just no instrumentation. He knew that the closest city with an airport that might be capable of handling an emergency was North Platte, more than 225 miles away, almost due west.

He woke Bud up with a little shout. As his copilot was climbing back into the right seat, he filled him in on the problems. "I need to do a little course correction. About fifteen degrees to the right... I think. That should get us heading to North Platte. Without the instruments, it's nothing but dead reckoning. Just sit there for now."

"Not sure I like that job, skipper," Bud told him. "What can I do?"

"Okay. See if you can get under the panel and look for a loose connector, or anything that might have caused the outage."

Bud climbed back out of his seat and into the aisle between the seats. Lying on his side, he shimmied forward and soon had his head below the front of the panel. "Uh, Tom? Little problem here."

Alarmed, Tom asked, “What’s the matter?”

“I can’t see anything. It’s too dark. You got a flashlight?”

Relieved, Tom pulled a small LED flashlight out of the pocket next to him. He used it to prod Bud. “Here. And, no more ‘little problems’ unless they pertain to our situation.”

Bud took the flashlight and rolled onto his back. He shone the powerful beam all around looking for anything amiss. Then, he spotted it.

“Skipper? *Big* problem down here. You know the back of this panel has the three big cable bundles connected to it? Well, one of them has some sort of device wrapped around it. Looks like it has a spring-loaded blade of some sort. Most of the wiring bundle is cut clean through!”

“Just the one,” Tom asked.

“Let me look again.” He repositioned himself. “Oh-oh! We’ve got major troubles, Tom. There is another one on the central bundle. I can just about see a little red readout.” He slid quickly back out from under the panel.

“It is just counting down to zero!”

“They both heard the snap sound from the released cutting blade. Tom almost immediately lost most of his control of the jet.

He moved the controls around trying to find some degree of reaction, but had little success. For now, the Toad was traveling almost straight and level.

For how long, he thought.

CHAPTER 4 /

CRISIS IN MID-AIR

“BUD. SEE if you can get out a Mayday. If the radio is dead, then try my pencil radio.”

Bud picked up his headset and pressed the ‘talk’ button. “Swift general aviation craft reporting a Mayday. I repeat. Swift aircraft reporting Mayday. Does anyone hear us?” He released the button.

Within seconds the radio came to life. “Swift aircraft. Central States Control. State the nature of your emergency.”

Bud looked at Tom. Tom said, “Looks like sabotage. Tell them.”

“Central States? Swift. We have what looks like sabotage to our flight instruments and controls. We are one hundred percent fly-by-wire and all systems and backups appear to be dead. We are squawking Alpha Echo Seven Niner Eight. Do you have us? Over?”

“Roger, Swift. We have your IFF. Do you have positive control at this time?”

“Central States? Negative. We don’t even have an indication of our radio frequency. We can’t change without possibly losing you, so please don’t ask. Something was placed around our electrical bundle that cut it through and through. We are currently at...” he looked at Tom who told him their last info, “...roughly ten thousand flying a course of roughly two six zero at a speed of three zero zero. All estimates. You copy?”

“Roger. We copy. Hold on for a minute while we look into options.”

Tom asked Bud to take the controls. Wiggling out of his seat and laying down, he said, “I’m not sure if it will do any good, but maybe I can splice enough of the wires together to give us some control. I think I remember a lot of which one does what.” He took the flashlight from Bud and asked for the small toolkit kept under the copilot’s set.

While Bud tried to keep an eye on the horizon and waited for Central States Control to get back to them, Tom got into position under the panel. After a few minutes of reaching straight up and trying to work, he muttered, “Got to make these panels so they swing up.”

He located and stripped seven pairs of wires, twisting them together and trying to keep them from touching, before his

extended arms grew too tires and began shaking. He let them drop to his chest.

“Anything up there,” he asked Bud, moving his arms to try to get circulation back into them.

“I’ve got a small indicator light just above the panel. I think it’s the ‘you’ve got a problem’ light. And—” he tried the different controls, “—I seem to have left vertical stabilizer movement but not right. I think I just set us in a very slow left turn. Sorry.”

“Don’t be. That’s great news. Pretty sure I know what wires will give you right steering. Hang on—”

Tom went back to work. In two minutes he had another trio of wires spliced together. The problem was swiftly coming where he would be out of space to move wires to avoid a cross circuit.

“Any sort of tape up there,” he asked, dropping his arms across his chest again.

Bud looked through the different pockets and storage areas. Finally, he came up with a small roll of painter’s tape that had been shoved into a map pocket. He handed it down to Tom. “Just this, skipper. Paint crew must have left it behind when they finished their work.”

Tom peeled off piece after piece, wrapping his splices to protect them from shorting. That finished, he went back to work stripping and splicing more wire pairs.

“Swift Aircraft?” The radio crackled back to life.

“Here, Control,” Bud answered.

“I regret to say that we have no suggestions down here. Do you have emergency egress equipment?”

“If you mean parachutes, then no. Not outfitted with them. We have an aircraft chute system, but no way to check if it will deploy. All systems are still pretty much dead.”

He described Tom’s work trying to splice together enough wires to gain some control. The ground control station asked that he keep them informed.

“How’s it going, Tom?”

“Try a right turn.”

Bud did. “Nothing.” His foot absently pressed against the left pedal. Immediately the craft yawed to the right. “You’ve got some wire crossed. The left pedal is now controlling the right stabilizer function.”

Tom blushed realizing his mistake. He soon undid that splice and located the proper wire. "Try now," he urged. Bud did and the craft turned back to the right. "Got it!"

Elated, Tom continued his work. By resting his arms every three or four splices, he was able to reconnect enough wires to give them full control of the aircraft as well as partial reactivation of their control panel.

Once he had been able to give them throttle, compass, altimeter and artificial horizon, Tom slid back out and sat in one of the passenger seats. Shaking his arms to bring blood back into them, he told Bud, "Give them a call and let them know that we can steer, Bud."

Bud radioed the Central Control people and was soon provided with a vector heading to get them to North Platte airport. "We'll radio ahead and tell them you're coming. You still don't have radio adjustment?"

"Correct. Negative on radio control, Control."

Tom slid back into the left pilot's seat and took the controls from Bud. "Thanks, flyboy. I've got it now."

During the next half hour they received several course corrections from Central Control. Finally, Tom called out that he had a visual of both the city and the airport. "Please pass along that we are coming in, Control," he radioed.

"Roger. Will stay online in case of anything else."

Tom had reduced both their speed and altitude over the previous twenty minutes. They were currently flying about 2,500 feet above the ground. He slid his fingers down the throttle readout to drop it an additional 15%. They began to lose more altitude.

Tom sighed and told Bud, "I probably should have thought to give us the air speed reading. Too late now."

Bud grinned at Tom. "My bet is that your brain already has figured out how fast we are traveling. Besides, the glide path feels right to me."

"Swift? Control. We have asked their control tower to activate landing lights once they spot you. You are to consider it their permission for immediate landing."

"Roger. Thank you and thanks to them." Tom reached out and adjusted his flaps. The jet slowed even more but gained some stability. He then reached for the controls to lower their landing gear.

Blanching white, he looked at Bud. "I forgot the landing gear controls!"

Bud shrugged. "I'd try for the soft grass between their runway and taxiway, then," he suggested.

Tom radioed their condition. Central control radioed back minutes later with the news that the airport did not have the equipment for making safety foam, so Tom was cleared for the grassy area to the outer side of their main runway.

"Too many cross exits between, Swift. Are you okay with that?"

Tom was and replied so.

The lights of the main runway came on, and even though it was daytime, Tom and Bud could see them plainly three miles ahead.

Tom brought the little jet to within thirty feet of the ground for their last half mile. As soon as they crossed the threshold point, he cut power even more and allowed the jet to settle to the ground.

Although very rough, the landing was successful Tom and Bud shut down all the working systems and exited the jet just as the airport's one emergency fire truck arrived.

A quick check showed some slight damage to the underside of the cockpit area, but nothing else. Tom thanked the firefighters for their response. They told him they needed to remain on station at least 30 minutes in case of fire.

Tom used his cell phone to contact Enterprises. He advised Harlan of the sabotage and requested that the *Super Queen* be dispatched with one of the large cargo modules capable of holding the Toad.

"Be there in three hours, skipper," he was assured.

The airport manager arrived in his car. He offered to take Tom and Bud to the terminal where they could rest and have some refreshments. They happily agreed to take him up on his offer.

Hours later, the *Super Queen* caused a major stir when she arrived, setting down on her repelatron lifters out beyond the runway and very near the damaged aircraft. The manager took Tom and Bud back out where they supervised the loading of the disabled jet.

Seeing the awe in the man's eyes, Tom took the manager for a walk-around of the entire giant aircraft. On arriving back at their starting point, he remarked, "This is the most impressive thing to happen to the North Platte Airport since President Johnson's Boeing 707 made an unscheduled landing back in 1966. Wow!"

While the crew finished their work, Tom and Bud took him onboard a quick tour. He left twenty minutes later even more impressed, and with autographs from both youths.

“Wait till I show my kids these. They’ll never believe I met the real Tom Swift!”

Once everything was loaded aboard, Tom and the crew took off and headed back to Shopton.

Tom and Bashalli’s dinner the following evening was subdued. Although Tom had put the incident behind him, Bashalli was struggling with growing feeling of dread for the young man she was in love with.

Tom tried to keep the conversation light, and Bashalli strove to match his attitude, but as they kissed goodnight on her parent’s front porch, she broke down and spent five full minutes sobbing in his arms.

Before she wiped away her tears and went inside, Tom held her close and made a promise to her.

“Bash. I won’t let them get me. As long as I have people like Bud to watch my back and you to come back to, I swear that you won’t lose me!”

Three days later he received a visit from Harlan Ames and Phil Radnor, Ames’ number two man.

“Thought you’d want to see and hear this, Tom. And, it comes with a bit of bad news. We got a great set of fingerprints off of those two cutters. They don’t belong to any Enterprises employee so we thought we could scratch that off the list. Only problem is, there hasn’t been any time when that particular aircraft has been out of our direct control. Just came off the line three weeks ago.”

“What does that mean, then?”

“It means that someone has been on premises who shouldn’t be. And that is where the bad news comes in. We did a check of all employees who could have had access. One came up missing. A painter from the Construction Company. We checked his house and found his body.”

Tom blanched. “Who?”

“Norman Hansen, with an ‘e.’ No relation to Arv. Two-year employee. He had been shot and his ID and TeleVoc are missing. Our bet is that his killer came in, found out about your trip, and placed those devices. He’s disappeared, of course, but we turned the prints over to the FBI.”

“I don’t think I knew Mister Hansen. Did he have any family?”

“A sister out in Nevada. No wife or children. Parents died in a train derailment accident ten years ago. We’ve notified his sister and she is coming to claim the body. Sorry to have to tell you about this, Tom.”

Tom nodded, sadly. Harlan and Phil left promising to keep Tom advised if the FBI came up with anything.

He and Bud repeated their flight the following day. No additional devices had been found on any other aircraft. Tom wondered if the device had been specifically meant for him. A quick check showed that the previous SE-11 was one of three Toads that could have been assigned to him that day.

It was a puzzle, for sure.

They returned late that night with a full set of findings that Tom began to review in the next morning. As he had thought, the route he wanted to use consisted mostly of solid ground over bedrock until the Mississippi Valley where the bedrock sank below the Damonscope’s ability to track. It appeared that the surface was saturated with water for a stretch of about thirty-seven miles before it became firm again.

Although Tom had many of the details for the train cars and the powerful engines that would streak them across the country in his head, he realized that without knowing who would be laying the track—and even to what gauge, materials, strength, and a host of other factors—it would be useless to try to work on actual designs.

He turned his efforts to working on the design for his large tunnel boring machines.

As it would be impossible to build more than five of them—financially as well as within the available time—he knew he would need to come up with something that could travel underground, tearing away rock and dirt, grinding it up and moving it all back and out of the tunnel all at a speed fast enough to allow five machines to tunnel the almost 1,800 miles of underground necessary to go through all mountains, hills and under cities along the path. Plus, they would need to move through highly compacted wet soil as they tunneled deep enough to go under the Mississippi Valley and River instead of trying to bridge that body of water.

With only three other construction companies taking on the final 1,100 miles of flat, relatively unimpeded land, things would be very tight. They would still need to surmount smaller rivers, roads and rail lines.

He knew that the longest tunnels would be those stretching

from the central valley of California to the point where it would exit the Rockies west of Denver, Colorado.

Scanning the detailed topographic map created by the Damonscope, he found only one surprise—a pleasant one—from the start of the Rockies all the way out past California’s Sierra Nevadas. There were at least three places where the trains could run on the surface. Two of them were only fifty or so miles long, but the third was almost two hundred miles. Certainly, the surface would need to be excavated and leveled, but a slight detour, adding only about seventy miles to the entire route, could mean a tunneling savings of weeks.

Even with the slight detour and additional track, his computations showed that the time savings not having to dig one continuous tunnel would be more than amply justified. Of course, he would have to convince the DOT to allow him to take on that portion of the project.

So, he figured, they would have one machine coming in from the west side of the Sierra Nevada mountains and another one from the state of Nevada that would be able to build the first tunnel of about two hundred forty miles before tracks came back to the surface for the first of the fifty mile surface runs.

At a hoped-for rate of four miles per day each, that would mean that the first tunnel could be finished in under a month.

If the other two tunnels to get beyond the Rockies could go that quickly, then he would be able to turn over tunnels at approximately one-month intervals to the Swift construction teams responsible for laying the rails and installing all of the utilities.

In all, his computations showed that Swift Enterprises should be able to complete their tunnel work in fewer than eight total months, including the necessary break down and reassembly of the TBMs plus transportation time cross country.

“Fortunately, he told Bud the next day, “the *Super Queen* will be able to transport a complete TBM in just two trips, assuming that I can build them to separate into quarters.”

“So, what if you can’t do that?” Bud inquired.

“Then, my friend, we’ve got problems!”

CHAPTER 5 /

TESTING...TESTING...

DAMON SWIFT was sitting at his desk when Tom arrived at work the following Monday morning.

“Good morning, Son. Have any time to enjoy your weekend?”

“Not really. I’ve been absolutely swimming in all the details. There’s just so much that we don’t know about from the other companies that all needs to be finalized before we can commit to *our* final designs. I’m beginning to think that we’ve bitten off too much.”

His father considered this for a moment before replying, “Have you made a ‘things we know that we don’t know’ list?”

“Sure. I did that two weeks ago. That, plus the associated ‘things that we do know’ list. That one’s quite a bit shorter.” He favored his father with a lopsided smile and a shrug of his shoulders.

“Do we have any idea about the track situation?”

“Well, the only thing I’ve heard—oh, that reminds me. We need to get the DOT to... um... ‘order’ the other companies to share information between all of us. I’ve run into problems with both the folks up in Canada regarding the rail cars as well as the head of Dumbarton Construction. They’re the ones who will be doing about sixty percent of the above ground tracks in the Midwest. Anyway, I’ve heard that the gauge is going to be custom. Probably seven feet instead of the normal four-feet, eight-and-a-half inches.”

“Is that good or bad for your computations?”

“Oh, actually it’s great. I can design the cars to carry almost thirty percent more cargo given the extra wide wheelbase. It will impact what sort of materials the CanPac people are going to have to use to get the necessary strength, but overall it is very good. Even better for the engines. I was a little nervous about the height of them making them unstable on narrow tracks, and this alleviates that entirely.”

“What’s the chance that the Canadians will run into big problems with the materials?” his father asked.

Tom thought, and then said, “If it were us, I’d say just use Durastress and magne-titanium. Great strength as well as lightweight. I already suggested it to CanPac, but they laughed me

off saying that they ‘were already on top of it,’ and that was that. To answer your question, I guess they are going to have problems.”

“Could we offer to do something for them—at cost—to help? Like mag-lev technology? Or materials they might need?”

Tom shrugged. They decided to bring the subject up to the Transportation Secretary that afternoon in a scheduled call.

His response was one of worry. He had been fielding calls from all of the companies involved and feared that one or more might pull out of the project.

“I agree with you that all of the companies must share information. This isn’t the time to guard secrets,” he told Tom and Damon. “I’ll make the necessary calls about that right now. Consider yourselves notified.”

“Sir?” Tom asked. “What is the fall back if a company drops out? Do you assign those tasks to the others or wait for volunteers?”

“Well, then, we ask the others to pick up the slack... if possible.” The Secretary let out a sigh. “Don’t tell me that the Swifts might do that, please.”

“No,” Damon replied. “I think what Tom is asking is what sort of thought has gone into such a possibility? Do you have a back-up plan?”

The Secretary admitted that he did not. With that, the call ended.

“Guess I’d better draw up some plans myself,” Tom sighed. “Things are going to be so tight that I don’t think anybody else could pick up enough of the slack to finish this, other than Enterprises.”

Tom spent the rest of the morning at his desk researching and typing away on a contingency plan. By one o’clock, he felt that he needed a stretch. Getting up, he nodded to his father and left the office, heading down the hallway toward the elevators.

“Whoa there!” a booming voice ordered.

Tom turned to see Chow with a cart full of serving dishes.

“I’m going to take a walk for a couple hours, old timer. Got to clear out a few cobwebs.”

“Giddy-up back into that office, youngin’” Chow demanded, pointing back down the hall toward Tom’s office. “It’s lunch time and I’ll be danged if’n I’m lettin’ you off the hook for gettin’ some

good vittles into you.”

Tom began to protest, but then realized how hungry he actually was. With a grin he raised his hands over his head. “Ya got me, pard,” he told the roly-poly chef. Turning and heading back down the hall he looked over his shoulder and asked, “What’s on today?”

Pushing the cart around the corner, past Munford Trent’s desk and into the large office, Chow answered, “Got ya a dee-liscious lobster roll with coleslaw and a cup o’ clam chowder that’ll stick to your ribs. I figger that I got to git as many calories into ya as I kin, whenever I kin!”

Tom sat down at the conference table while the cook set out his meal. The aromas were enticing; Tom’s mouth began to water as Chow uncovered the chowder and the smell of the hot cream and the clams assailed his nostrils.

“Aren’t you eating, Dad?” Tom asked.

“No, Son. Chow kindly packed me a lunch that I will be eating on my way over to see Jake at the Construction Company. We need to go over some figures for a meeting next week. I’m scheduled to appear in a video conference with the House Committee on Nuclear Power in about two hours.”

With that, he picked up his lunch bag and briefcase and left the office.

As Tom ate heartily, Chow pattered around his cart looking like he wanted to ask something.

“This is wonderful, Chow,” Tom told him. Seeing the look in the older Texan’s eyes, he asked, “What’s on your mind?”

“Wahl, I’ve been talkin’ to some of the guys over in the injuneering department, and they’ve been tellin’ me about your loco-motive project.”

“Right,” Tom said cautiously, unsure where the conversation was going.

“Anyways, when I asked ‘em about this here high speed train, they told me you’re plannin’ on runnin’ it through a really long tunnel. And Buddy Boy tole me that you’re bypassin’ Texas altogether.”

Tom smiled. He knew that Bud never missed an opportunity to kid the Texan. He also knew that the cook was proud of his Texas roots.

“Well, Chow, the truth is that we are going to run a couple of tunnels underneath both the Sierra Nevada Mountains as well as

the Rockies, and then under the Mississippi Valley. And,” he had to admit, “we won’t be going anywhere near Texas. The plan is to make the run as straight as possible so we can get the train from coast to coast in less than a day.”

Chow whistled. “Golly, Tom. That’s amazing. How fast’ll she go?”

“Well over a hundred and sixty,” Tom replied. He filled Chow in on some of the details of the train, the tracks and the tunneling equipment that was being built.

Chow scowled. “Why are you runnin’ this thing on old-fashioned tracks? Why not your G-force thingie?”

Tom laughed before answering. “Do you mean the G-force Inverter from the MonoSwift?”

“Yeah. That’s the gadget. Wouldn’t that make things easier?”

“Yes and no. You see, the specs from Uncle Sam state that we can’t do anything using electrified tracks or something that uses what they call an ‘exotic technology.’ At least, not one that is dependent on putting power or pumping Serpantium gas through the rail system.” He thought for a minute, then continued, “Of course, that doesn’t rule out putting the gas into each wheel and building something that is self-powered... hmmm?”

Now, Tom’s mind began racing. One of the main problems he was trying to overcome was that of the great amount of friction the wheels and tracks would generate. Since each rail car, fully loaded, would weight more than twice that of traditional trains, and that downward pressure was going to quickly build up heat, he had been toying with devising some sort of cooling mechanism.

“Chow? I think you’ve got...” Tom turned to thank the cook, but Chow had tiptoed out of the office while the inventor was ‘away’ thinking. “...a great idea,” he finished softly to himself.

Tom jumped up and went to his desk where he had a copy of the Government specs. Leafing through it he could find nothing that precluded self-powered means of reducing the downward pressure and contact between wheels and track.

An hour later, when Damon Swift had returned from his meeting, Tom broached the subject.

“What do you think, Dad?”

Rubbing his jaw, an action that father and son shared when they were thinking over an important matter, he finally said, “We should make a call and see what the DOT think. If they can accept

it, then we have to find a way to work with the other companies laying the rest of the track. I've got a suspicion that it will be an uphill battle, even with Government backing for the idea."

The Transportation Secretary was unsure about Tom's suggestion. "If it's the only way to protect the wheels, then we have to look into it, but I'll be frank. I've got a much larger headache right now. The Canadian firm that is supposed to be doing the Denver to Southern Nebraska leg plus all of the freight cars is about to pull out."

"What will that mean to the project, sir?" Tom asked.

"Probably, it will mean the death of it," the Transportation Secretary told him, sadly. "Unless..."

Tom knew that the older man was opening a door for Swift Enterprises. He looked at his father, who nodded. "Mr. Secretary? If we can move on this immediately, as in today if possible, I believe that Swift Enterprises could pick up the rail laying part of their contract. It might be best if one of the other two construction companies did the basic surface work, however."

Both Swifts could hear the enormous sigh coming from the other end of the line. "Good. I was hoping that you'd offer to keep us on track. Pardon the pun. I'll get right on this and give the Canadians an 'in or out' ultimatum today."

They discussed several matters pertaining to the increased Swift presence and then rang off.

"Well, Tom. Are you positive we can pull this one off?"

Tom nodded. "I'm always positive, Dad. You know that. Now, I just have to make sure of it! This will also give us leverage in what needs to be done to allow for our self-powered load lifter."

The next afternoon the two men were sitting at their desks when Tom excitedly exclaimed, "Yes!"

"I'll assume that is a good sign, Son," his father said.

"Oh, it is. Really. I just figured out the way to use a variant of the G-force Inverter technology in the rail cars and the locomotives to provide just enough lift to cut down heat build-up by better than fifty percent, plus keep enough weight on the tracks to ensure stability."

He explained the new circuitry he had already sketched out that would become part of every rail car. It would actively weigh each car and feed that information into a small, specially built computer. That would, in turn, check on such things as traveling speed and any cross winds or other factors that might affect the

cars.

“The bonus is that we just turn up the juice when the train starts out and lighten the load allowing the locomotive to accelerate quicker.”

“You’ve taken into account that overcoming mass, regardless of downward weight, and therefore friction, is going to be the same, right?”

Tom grinned and nodded. “Absolutely. But I figure that better than forty percent of the torque necessary to just get things moving is related to that friction. If we can overcome half of that for, say, the first thirty or forty miles per hour of forward speed, then I believe I can halve the time necessary to get the train up to final speed!”

“And, once the train is at speed? Then what?”

“Then,” Tom told him, “we can adjust the load to accommodate excess heat build-up.”

He told his father that each car would feature a small dynamo in one of the wheels that would provide power to the system. It could also tap into the power of a Solar Battery through the entire trip. That battery would be the back-up source of power for the inverter long enough to stop a train and fix things, in case of a problem.

“So, instead of having a lot of your circuitry in the tracks, you will be carrying that in the rail cars? What about the weight factor?”

“Negligible, Dad. Probably about fifty pounds per car. Maybe fifty-five. All we have to do is lay a special wire along the top of the tracks that will be used by the inverter. I’m pretty sure that the steel tracks being laid by the other companies will be sufficient for our use.”

“Whoa. I’ve been a little out of things what with the Venus space probe project. Are you suggesting that we are not going to lay steel track in the tunnels?”

“Exactly! I’ve figured that there would be insurmountable issues trying to anchor the tracks to the tunnel lining. I hope to lay Durastress rails right along with the tunnel as we move along. The Durastress is going to last at least as long as any steel rails, plus there will be zero issue with rust.”

“But, how are you going to do that?” Damon wanted to know.

“Well, I figure to do it the same way I am going to line the tunnel.”

“How are you planning to do that, Son?”

“I haven’t completely figured that one out, yet. But, I’m working on it!” He grinned.

He explained that the intent was to build TBMs that would be a combination of boring machine, coating device to line the entire inside of the tunnel, plus the ability to either extrude or at least embed tracks right into the floor of the tunnel.

Damon whistled as Tom described the intended machine. “Quite an undertaking, Tom. I have to ask you once again if you truly believe you can pull it off?”

Tom nodded. “I’ve made the list of what I need for my TBMs, and we have a lot of it right on the shelf.”

“What does that leave to be done?” Damon asked his son.

Tom pondered the question a moment, then said, “I think that I need to start by making sure that I can extrude an inner shell right after the TBM cuts into the rock and earth. And, that’s going to mean that I have to start coming up with some possible formulas for the coating materials. Something that we can keep in liquid form—possibly under pressure—and then spray or push it out and onto the walls.”

His father added, “It will need to adhere to the walls without any slumping, and then dry or cure almost instantly. To top that off, you will have to come up with something that is as strong as reinforced concrete. Something that won’t break down over time. Do you have any ideas?”

Tom did but told his father that he wanted time to do some experiments before mentioning anything specific.

Damon wished him luck as Tom left the office, heading for his main lab.

Once there he called Arvid Hanson, the lead model maker for Swift Enterprises. Arv arrived at the lab five minutes later.

“What’ve you got, skipper?”

“I have a set of preliminary drawing for the front end of the locomotive engines. I wonder if you could run a scale model up, including a chassis, and get it set up in the wind tunnel for some tests next week?”

Arv left soon after with the promise to have everything ready by the weekend.

An hour later he was so engrossed in his work that it took several throat clearings before he registered that someone was in

the room with him. Looking up, he smiled at the sight of Bashalli and Sandy.

“For all you knew, Tom,” Sandy chided, “we could have been standing here naked or dead or holding nuclear weapons. What is so important that you can’t look up to see the two most attractive young women in Shopton?”

They came forward to stand on either side of Tom’s stool.

Bashalli leaned in and kissed him lightly on the cheek. “Oh, my!” Sandy remarked. He blushed.

“Well,” Tom said, trying to regain his composure, “I’m trying to work out how to coat the inside of the tunnels we will be digging.” He explained several of the many problems that would need to be overcome in order to be successful.

Sandy asked, “Why don’t you just pull sections of the tunnel in after you then sort of glue them together?”

“I think I might understand why, Sandra,” Bashalli offered.

“Go ahead, Bash. You’re an artist and spatially-oriented. I’ll bet you really do know.”

Bashalli smiled at her guy then turned to Sandy. “You see, it is a matter of size and available area. If you build a box of, oh, ten feet on each side then the first piece you bring in can be that size. However, the next section needs to fit inside of that, so it might only be able to be ninety percent the size of the first one. And so on.”

Sandy brightened. “Ah. I see. Law of diminishing returns, huh?”

Tom nodded. “Bash is absolutely right. Also, unless I could figure a way to drag hundreds of miles of tunnel behind the boring machine, then we’re stuck with either assembling the lining in place—and that entails a lot of problems with transporting the thousands of pieces into the tunnel—or we have to create the lining as we travel underground.”

“So, the best bet is to do the latter?” Sandy asked.

Tom nodded.

“I think,” Sandy concluded, “that I am going to need to go on to college and take some engineering classes. Put me behind the stick of a plane and I’m right with the program. It’s all this detail work that is beyond me. How did you figure it out, Bashi?”

Reaching out and taking Tom’s hand, the raven-haired beauty replied, “Several of my art classes have dealt with solid-form art.

Sculptures, statues and the like. One of the things they drummed into us was understanding what area you have to work with and how to plan to use that area, even when you create something that is technically too big to fit a given space.”

“Like knowing how to orient a sofa to take it up a flight of stairs without getting stuck,” came Bud’s voice. He had walked into the lab a few moments before.

“And, to put it in piloting terms, it is like being able to compute mentally what altitude you need to safely perform an acrobatic maneuver.”

Sandy brightened. “I get it!”

“So,” Tom asked giving Bashalli’s hand a little squeeze, “what do I owe the visit to?”

His sister’s eyes widened. “Gosh. I almost forgot. Bashi and I came up with the absolutely final list of people for the party. We are going to drop it off right after we leave here, but,” she looked meaningfully at her best friend, “Bashi wanted to see you. So, here we are.”

“I’m glad,” Tom said. Bashalli gave his hand a long, meaningful squeeze.

“You didn’t come to see me?” Bud asked in mock sadness.

Sandy crossed to him and put an arm around his neck, pulling his head closer to his, she moved her mouth so that her lips were just a fraction of an inch from his left ear.

“Nope!” she stated in a normal tone of voice.

The foursome all laughed.

“Listen, I came in to ask Tom something, but I’d be happy to accompany you two over to Security right after that,” Bud stated.

Sandy and Bashalli looked at each other. It appeared to Bud that they were communicating telepathically. At the precise same moment, they turned to him and said, in unison, “Yes, Budworth. Please.”

Bud was astonished and his mouth hung open. Tom had seen the little sign passed between the girls, just a twitch of the lips and then a small eye blink.

“Put your mouth away, Bud. They’ve just pulled one on you,” Tom advised his friend.

“But, how—” was all the dark-haired flyer could manage.

Each girl took an arm and began leading the slightly stunned

Bud from the room, when he suddenly remembered the reason for his visit.

Turning, he asked, "Chow tells me that the plans for the rail route have been changed, and that there will be an interim stop in Dallas. What gives?"

Tom smiled, and decided to needle his friend a bit. "Oh, yeah. I forgot to tell you. Chow brought up the need to get live cattle to New York as quickly as possible, so I mentioned it to the DOT Secretary. He agreed. It adds about a thousand miles to the project, but all that will be offset by lowering the price of beef on both coasts."

Bud looked at Tom and his shoulders sagged. "Rats! I bet Chow that he was wrong. Now I've got to be guinea pig for his concoctions for the next two months.

Tom couldn't keep a straight face any longer. "Bud, relax. Chow is just having it back at you. The only thing that might change is we may add a switching point along the route to accommodate an eventual Chicago to Dallas line."

"I am so going to get him for this," Bud murmured.

Sandy swung him around and said, "Oh, no you're not, Bud Barclay. He got you fair and square."

With that, the three friends left the lab and Tom returned to his tunnel lining problem. The more he thought about the issues involved in forming a tunnel shell as he dug, the more concerned he became.

Is this actually possible? he asked himself. Or have I doomed the project with this whole tunnel concept?

CHAPTER 6 /

PARTY POOPER

ON MONDAY, Harlan Ames poked his head into the shared office and addressed Tom. “Just finished going through all of Sandy’s guests for the party this weekend.”

“Any problems?” Tom asked.

“Just one that raised a flag. Fellow by the name of Larry Carpenter. The security search flagged a problem with his father. Evidently, his old man was a bit of a rascal in his college days. Several arrests at various protests. Pretty innocuous stuff except for one. He was part of a protest against The Swift Construction Company seventeen years ago.”

“What was that about?” Tom asked.

“It was a protest against your father and his participation in the Space Shuttle program. Swift Construction was building a piece of scientific equipment to measure the radiation levels in different portions of the cosmos. Their beef was that we had small amounts of radioactive isotopes for testing purposes on site.”

“What was this guy’s father’s involvement?”

“Threw a fire bomb over the fence. Wouldn’t have been too bad except that it sprayed burning gasoline over three security guards, severely burning one of them.”

Tom promised to have a talk with Sandy. He didn’t want to accuse the son for the sins of the father, however....

After calling her to discuss the situation, she promised that he was not one of the main invitees. “Don’t worry, Tomonomo. He is just sort of a friend of a friend that I also want to invite. It will be easy to take him off the list.”

On the evening of the party, Harlan and Phil checked the identification of each person arriving at the gate. They also found themselves confiscating small amounts of alcohol that five boys and three girls were trying to bring in.

Each teen gave over their contraband with a promise from the Enterprises security team that nothing more would be said about the matter.

By the appointed start hour of 8:00, only seven guests had not arrived. “Good thing we got out here at 7:00, Harlan,” Phil commented.

“Yeah. I figured a few would arrive a little early. I didn’t think they’d all get here an hour before it started. What ever happened to being fashionably late?”

Three of the stragglers arrived minutes later, and another couple ten minutes after that, but the final two never came to the gate.

Sandy had engaged a band from the community college in Thessaly. Right on time, they began their first set of music. In seconds, more than half the guests were on the makeshift dance floor. Others stood around looking embarrassed—mostly boys—with an equal number of girls looking expectantly at them.

Sandy and Bashalli went from reluctant person-to-person greeting them and urging them to find someone and go out and dance. They had carefully balanced the guest list with precisely the same number of boys as girls.

When the band took their first break, the afternoon DJ from WSHP radio took over and played top twenty hits from his large CD collection.

Chow and an impromptu staff of servers set up a delicious buffet along one wall of the underground hangar during the second live music set.

The hungry and thirsty teens converged on the tables and were soon devouring burgers, sandwiches, salads and even the vegetable platters Sandy had insisted on, things Chow had just scratched his head over.

“Cain’t tell me that no group o’ teeny boppers is gonna want to munch down on carrots an’ broccoli an’ radishes. What next? Dan-dee-lion greens and soybeans?”

By the end of the evening, even Tom and Bud agreed that it had been a wonderful idea to hold the party at Enterprises. Everybody had had a great and safe time.

Those with cars had been allowed to park them inside the main gate in the visitor’s lot. They departed in an orderly manner while those who had been dropped off by parents were picked up just outside of the Swift’s private gate several hundred feet farther along the west wall.

Hugging Bud’s right arm with both of hers, Sandy let out a contented sigh. “Oh, Bud. It was wonderful. Absolutely everyone had a wonderful time. Everyone!”

Bashalli rewarded Tom with a kiss. “I believe I danced more with you tonight that in all the other times we have gone out. I am now officially tired and cannot dance for at least a month.” She

gave him another peck on the cheek as Harlan Ames approached them.

“Uh, Tom? I don’t want to bother you, but I have a perplexed and somewhat bothered father at the main gate. He claims that his daughter and her boyfriend were brought here by another couple. Only thing is, they are the two kids that never showed up.”

Tom looked worried.

“Now, he wants to know where she is.”

“Any idea about the other pair? We could ask them.”

“Yeah. They decided to leave the party early and have a little tryst of their own. Chief Slater called an hour ago to let us know he had them.”

“How did he know to call us?” Tom asked.

“They had their invitations on them when an officer spotted them in the park, downtown.”

Tom excused himself from Bashalli and left with Harlan to talk to the distraught father.

“I don’t know what could have happened to her. The kid she’s seeing isn’t a rocket scientist, but he’s a nice enough guy. Where can they have gotten to?” The father continued to pace, something he had been doing since arriving at Enterprises.

Harlan suggested that they all take a seat in the guardhouse. “Let’s start with who picked them up to bring them here.”

The man only knew the first names of the couple. Harlan thought a moment and then used the phone to call to the underground hangar. Sandy answered.

He told her briefly of the issue and asked if she knew the couple with the car. “Barry and Lindy are their names, Sandy. I don’t have the guest list on me. Ring any bells?”

“Sure, Mister Ames. Barry Gleeson and Lindy Price. They were some of the first people to get here. Wait a minute. I’ve got her phone number in my cell phone.” She gave him the number.

When Harlan reached the girl, she was just getting home.

“Yes, sir. We picked Jackie and Doug up, but Doug said that he wanted to talk to Jackie alone, so we dropped them off about half a mile from your gate. I don’t remember seeing them at the party to tell you the truth. We left early. Sorry.”

Ames filled in Jackie’s father. At about the same time Sandy, Bud and Bashalli arrived. They had found Doug’s home phone

number. Harlan called it.

“Why, no Mister Ames,” Doug’s father told him. “He isn’t home yet. Told us he wouldn’t be back until about midnight. That’s... let’s see... another forty minutes. Is there any message?”

Harlan didn’t want to unduly worry the man so he merely left his phone number and asked that Doug call him as soon as he returned home.

His next call was to the Shopton Police department. The night Sergeant took all of the details and promised to have several patrol cars in the vicinity within ten minutes.

He turned to Jackie’s father. “I don’t think it’s the time to worry just yet, Mister Henesey. They’re kids. Maybe they had an argument and one of them stormed off. I’m sending our own men out to circle the perimeter of Enterprises. They might have just kept walking and talking. It’s quite a long way around. We’ll find them.”

“If it’s all the same, I’d like to wait here.”

Harlan and Tom agreed. Soon after, Tom left to make sure that the underground hangar would be ready to have the *Sky Queen* hauled back inside the next morning.

But, an hour later there had been no news and no call from either of the missing teens.

“You go home, Mister Henesey. Your wife will be pretty worried by now. I’ll give you a call the second we hear anything.”

With only minimal protest, Mr. Henesey went home.

“What do we do?” Sandy asked with a very worried look on her face just as Tom returned to the guardhouse.

“The hardest thing to do. We let the Police do their job. You all head home. Right after I give the Heneseys and the Jameses any news I get, I’ll call you. Okay?”

Tom suggested that Bud take Sandy home while he would drive Bashalli to her parents’ house.

Exchanging knowing looks, both boys took circuitous routes to their destinations on the slim chance that they might spot the missing couple.

Neither duo saw anything to assist in the search.

When Tom arrived home, Sandy was beside herself with worry. Their mother was in the kitchen making a cup of cocoa for her while she sat in the living room talking to Damon Swift.

Tom took the cup in to her.

“Don’t worry, Sandy. They’ll be found. It isn’t your fault that they chose to get out of the car to take a walk. You had absolutely no control over their actions.”

“But, what if someone kidnapped them to get at you?” she wailed.

“San. Nobody who might want to get at me would have known that they were coming to the party. There’s some other explanation.”

Only slightly mollified, Sandy went up to bed with the rest of the family following shortly behind.

The morning brought no news. The four Swifts sat at the breakfast table in silence. Sandy’s eyes were red-rimmed, a sure sign that she had gotten little or no sleep and had been crying.

Tom placed a comforting hand on her forearm. She looked up at him and gave a tired, almost defeated grin.

“I’m going to go out and drive around Enterprises again. Maybe I can spot something in the daylight,” he told her.

The phone rang. It was Bud. He had the same idea as Tom so they decided to coordinate their search. Bud would take the north and east areas and Tom the south and west. Both boys would check an area from the walls out at least a mile from Enterprises.

Sandy wanted to go too, but Anne Swift told her, “You’re not going out anywhere looking like that and as tired as you are. You head back upstairs and take a nap. You can go out this afternoon.”

The first two hours of Tom’s driving provided no clues. He was about the call Bud to see how he was faring when his cell phone rang.

“Tom, Get over here to the north of Enterprises. You know that wooded area between Persimmon Street and that new Vestron subdivision? I’ve found something!” His voice sounded ominous.

Tom raced to the location where he joined Bud. Together, they quietly approached a pair of bodies slumped against a tree. Tom’s heart sank as he saw the two missing teens. They lay slumped together, heads touching, hands clasped. Neither one moving.

They look so peaceful, he thought.

He looked at Bud. Bud shrugged and swung a swift kick into the bottom of the boy’s feet.

Startled and disoriented, Doug cringed away from the assumed attack. He took a couple of deep breaths as his girlfriend woke up with a start.

“What? I didn’t do it,” he protested. Then, he saw who was

standing over them and stopped. He got up and helped Jackie Henesey to her feet.

“Just where the heck have you two been?” Bud demanded.

“Why didn’t you come to the party, and why didn’t you call someone?” Tom added in an angry voice.

Jackie began trembling and sobbing.

Doug straightened himself up and addressed Tom and Bud.

“Uh... well... you see, it’s kinda like this. We sorta got engaged last night and just walked and talked and got lost. I forgot to bring my cell phone and Jackie left hers at a friend’s house the other day.”

Leaving Bud to lecture the pair, Tom walked off and called Harlan Ames to tell him of their find.

“Tom,” the security man said. “I hope to god that my daughter turns out to have more brains than hormones, I really do!” He said he would make all of the standard calls.

“Why don’t you take them to Shopton General to be checked out. Just in case a night in the open did anything to them. I’ll have the parents pick them up there.”

On Monday morning, Harlan walked into Tom’s lab. “Bad news, skipper. Sometime over the weekend, we had a saboteur sneak in and destroy the scale model of the train engine. It was being assembled in The Barn before running wind tunnel tests.”

Although greatly bothered, Tom knew that the non-working model had been a shell that could be easily recast by Arv Hanson.

“Any idea how they got in?”

“I am afraid that he or they got inside in one of the cars Sandy’s guests drove into our lot. Of course, that doesn’t explain how they could move around without being detected by our security systems.”

Each Enterprises employee wore a small TeleVoc pin under their collar. This combination communications and security device sent out a signal to the security scanning system identifying the wearer as an object to ignore. Only moving objects the size of a baseball and larger would be flagged by the system and would cause a notification alarm to be issued.

Visitors, including Sandy and Bashalli’s guests wore a clip-on badge that provided the same security function, plus it allowed the system to keep track of the whereabouts of each guest.

“Phil and a couple others are going through all of the guest activity logs. We never set things up to beep us if one of the kids

left the hangar. Sorry for the sloppy work. Won't happen again."

By the afternoon he was back. "I think we have our culprit, Tom. One of the guests did leave the party about 9:25. We have his badge moving across the tarmac to The Barn, remaining there only about four minutes and then heading right back to the hangar."

"Do we know who it was?"

"Yeah. Bit of a poser, though. It was issued to the boy who picked up our missing couple. *Barry Gleeson.*"

Harlan arranged to have the police pick up the Gleeson boy. He went down to police headquarters to take part in the interview.

The sullen youth refused to say anything at first. He sat, slumped in his chair and staring at the tabletop.

"Barry. We have you and your security badge leaving the party at 9:25 and returning there about ten minutes later. During your trip, you went into our construction shed and destroyed a valuable piece of equipment. Then, you hightailed it off the premises fifteen minutes after that. Explain!"

Barry shrugged.

Harlan decided to take a tougher approach. He pulled a folded piece of paper from his inside suit jacket pocket and waved it toward the teen.

"This is a writ charging you with espionage and destruction of property. Unless you can prove that someone else took your badge and did this damage, and then returned it to you so that you could check it back in, then you will be arrested and taken from here to federal prison to await trial. No bail. And, you'll be there for many, many weeks. The court system is really backed up these days!"

Barry began to sweat. He looked nervously at the police interrogator, who simply nodded at him.

Looking up at Hank, he stammered, "I... I... um... I didn't d-d-do anything. I swear! I mean, I sorta did go outside and all that, but I had to. Larry told me that if I didn't, he was going to tell my folks about me doin' drugs and everything. I had to do what he said."

He poured out his story. Larry turned out to be Larry Carpenter, the youth Harlan had originally flagged as having a father with an anti-Swift past.

Barry had gotten into using drugs the summer before. His supplier and fellow user was Larry Carpenter. Larry had evidently

cleaned himself up while Barry had been unable to break his growing addiction.

Hank and the policeman left Barry in the interrogation room while they went into the hall to talk. The policeman left for a couple moments and then returned. They reentered the room and sat in silence for almost twenty minutes.

There was a knock at the door and it opened to reveal Larry Carpenter, in handcuffs, being escorted by a pair of officers.

As he had pushed through the door he noticed Barry sitting there. With an almost animal grunt he flung himself at the seated boy.

“You miserable son of a—” was all he got out before one of the officers used his TASER on the violent young man. The youth collapsed to the floor.

Carpenter was picked up and shoved into a chair where his handcuffs were attached to a ring on the arm. One officer checked his pulse to ensure the electric shock had no detrimental effects, then he nodded to Ames.

When he had recovered from the shock, he sat glaring at everyone in the room.

“Do you want to tell us what all this is about?” Harlan asked him in a calm voice.

Larry glared even harder at Harlan before spitting out, “You Swift toadies will all get yours. You all think you’re so smart. Well, my dad is ten hundred times more smart than you. Even smarter.”

He sat back with an evil grin.

They all sat in silence for another minute before Harlan addressed Barry. “Even if he did goad or threaten you into doing what you did, unless you can tell us what he did and what he said, you’ll go to prison.”

“Shut up, Barry,” Larry growled.

“No. I’m not going to take the blame. Go ahead and tell my parents about the drugs. I’d rather go to rehab for a month than to go to prison for years just because you’ve got a hate bug up your butt!”

Larry Carpenter tried to pull his arms away from the chair without success.

“You open your mouth, and my old man is going to shut it, permanent! *You hear me! You’re all going to die!*”

CHAPTER 7 /

THE GOPHER

“GIVE ME a clue,” Bud requested of Tom as he looked over the behemoth taking shape in Building 4 at the Swift Construction Company the next day. “It’s certainly could win an ugliest machine contest!”

Tom looked at Bud and slowly shook his head. “I just wonder about your sense of esthetics, sometimes, Bud. This beautiful monster is just the front end of what will become one of our boring machines.” He patted the thing.

Bud began opening his mouth, but Tom knew what was coming and cut him off.

“Tunnel boring, Bud. Exciting, tunnel boring.”

Viewed from the front, it appeared to be a strange mathematical symbol taking up the full area, side-to-side and top-to-bottom. Two large circles connected near the top and bottom by horizontal rails. This was all held away from the main body by about ten feet by a set of six substantial posts. At least seven mounting brackets were attached to the ‘body’ behind the head. Bud couldn’t hazard a guess at what would go on them.

“So, what goes round and round the circles?” Bud asked, indicating the odd device. “And, back and forth for that matter,” he added.

“A set of earth blasters will run around and around, one in each circle. They will eat away at the rock and dirt and whatever else we run into down there vaporizing the outline of our tunnel. Do you see the horizontal rails above and below the cross point?”

“Sure. I thought that might be some sort of bracing.”

Tom explained that two other earth blasters would move side to side on the rails helping to create the center portion of the bore. “All those blasters will be focused to just make our outline. Behind those and attached to the mounts on the front of the main body will be several wide-angle blasters that will vaporize everything inside of the outline. And, the main body is slightly smaller so it fits right inside of the hole as we move forward. A series of grooves will be cut into the center area and corresponding cogs will be able to use them to pull the TBM forward.”

Bud thought for a minute, trying to visualize the process. He

suddenly brightened. “Oh. I think I get it. You end up with two large circles—I guess those will be where the trains will run—sort of separated by a rectangular area. Right?”

Tom nodded, grinning at his friend.

“So... you have trains on both sides and...” he stopped, looking baffled. “What goes in the middle?”

“That will be a roadbed set up for emergency vehicles and to allow any evacuation from a disabled train. See?”

Bud said that he did. He pointed at one of the circular rails. “It really is huge. Looks big enough to run two trains in each side.”

“It will. You see, we have to allow for any eventuality such as a broken down train. Can’t have it blocking one entire direction, so each side will have two sets of tracks. One for the high-speed trains and the other as a safe side line just in case!”

He went on to describe how the debris and vaporized materials would be sucked into a number of intakes and then propelled out the back of the boring machine. “We’ll have a lot of stuff to haul out, but we shouldn’t have to go far with it. We already need to have vertical shafts every ten miles or so to allow for pressure relief. We’ll haul it out through them.”

“Why vents?”

“At the speed these trains will travel, if we didn’t, they would quickly build up their own wall of compressed air which would slow them down and cause the engines to require more fuel to power them through.”

“Sort of like the sound barrier?” Bud asked, referring to the pressure that builds up in front of aircraft as they approach the speed of sound.

“Just like that. Only in this case we can’t make the tunnel large enough to offset that. Especially when two trains pass heading opposite directions. The pressure has to go somewhere, so we will make all these shafts straight up. And, that’s where the digging debris will be removed.”

“Sounds like a beautiful thing for such an ugly machine to be doing. Can I take a pot shot at the name?”

Tom knew that his friend loved to come up with pun names for all of his inventions, so he gave a slight bow and said, “Be my guest. Boring machine is, well, boring.”

Bud thought. He walked up to the front and down both sides looking up and down. Finally, he turned to Tom. “It digs. It makes piles of digging rubble. It is definitely ugly. I hereby christen this

monster, the Gopher!”

Tom nodded and laughed. In fact, he laughed a lot more than Bud thought appropriate. Once he caught his breath, he explained. “Dad, Mom, Sandy, Bash and even Hank have all been by here the past couple days and you all have suggested that it be called ‘gopher’ or ‘mole’.”

Bud laughed and then squinted his eyes and held a thumb up toward the front. “So, how big a hole is she going to make?”

“The total is thirty feet high by seventy wide. Each direction gets a thirty-foot wide tunnel and the center is almost ten feet wide by ten high.”

“Jetz!” Bud exclaimed. He looked at the machine again. “Uh, how wide are the trains going to be?”

Tom smiled at him. “Why do you ask?”

“Well, and I’m no math genius, but if you look at the curve of the tunnel and then figure you need to move the rails away far enough so you don’t scrape into the walls...”

“And there will be two trains in each side...” Tom urged Bud on.

“Then, I’d guess that each train can’t be more than eight or so feet wide. Are they going to be really tall?”

Tom described the trains. “The engines will be about nine feet wide, fifteen feet tall, and fifty feet long. The cars behind them will a couple feet taller and a foot wider but would sport a unique bulge extension that would take advantage of the curvature of the tunnel.

“Our computations show that by keeping the outer side of each car about fifteen inches from the wall, we get an amazing, stabilizing ground effect. Plus, it increases the capacity of each car by more than fifteen percent.”

Bud tried to follow. “So, square on one side and rounded on the other?”

“Exactly. And, once the train is turned around, the bulge area moves to the other side of the tunnel.”

Overall, the tracks would sit about five feet above the bottom of the circular tunnel. This would allow for the running of all cabling, conduits and emergency equipment such as fire suppression and water pumping.

“Well, I can hardly wait to see what tags on behind this behemoth,” Bud commented.

"I'm still working on that, Bud. But, I think that we need to make this an all-in-one device. Tunnel borer, vaporizer, debris loader and wall coater."

"Are you planning on spraying concrete all around the tunnel?"

"No. We couldn't get enough of a supply and have it on site *and* delivered frequently enough to supply five of these. Besides, concrete is porous enough that you need to put a membrane between it and the rock to keep out thousands of gallons of seepage."

"What, then?"

"I'm working on a new spray-on polymer. Something that can be sprayed by an automated system so we get a very even coat. It also will be self-expanding and harden in minutes to be stronger than concrete."

Bud whistled. He told Tom that is sounded like a tall order. "Are you close?"

Shaking his head, Tom admitted that his efforts had been minimal so far. He had spent most of his recent time on the design and building of this first digging head.

Bud left minutes later to attend to a small family matter, leaving Tom deep in thought. Although it needed testing, Tom theorized that the ultra-hot temperatures from the earth blasters would melt all the surrounding rock and then it would quickly harden into a solid shell. That meant that the interior coating would only need to be about three inches thick, not the typical twelve to twenty inches when concrete is used in a mechanically bored tunnel.

But it was that actual spray-on coating that Tom really needed to work on. If he couldn't come up with something acceptable, then the entire project was in jeopardy. He returned to his laboratory and began experimenting with different polymers.

Several hours later he rose and stretched. He decided that a walk was in order so he left the lab and began walking around the central building complex. As Tom rounded a corner, he was just in time to see an Enterprises crew beginning to build one of the ramps he would use for his Y-4 engine demonstration the following month.

The original repelatron skyway rig had been pressed into service laying first a flat, long road as well as the short guardrails on each side. "Oh, the adventures we had," he said softly, toward the machine. Tom and Bud had used it to build a road across the

African nation of Ngombia, uniting the two halves and crossing a treacherous swamp using his repelatron technology. He had originally envisioned the machine as a multipurpose fire fighting, sky writing, lifting platform he had dubbed the Workcopter, an enhanced version of his GraphiCopter skywriting unit.

“She sure did a great job spraying out that road,” he muttered as he began walking again. Tom stopped. He turned and looked at the skyway machine. Letting out a little whoop of joy, Tom raced back to his lab.

It isn't the machine, he thought, it's the skyway foam!

The foam was dispensed from the Workcopter in a wide, six-inch-thick layer that almost immediately hardened. As it was pumped out, air was mixed in to make it incredibly light while the cellular structure of the hardened foam made it amazingly strong.

Why not, he considered, use a variation of that same foam but with less air.

That evening, he told his father of his idea, adding, “I’m pretty sure that we could rig up a ring of dispensers at the back of the digging machine that would spread out the appropriate thickness. If I mix it correctly with the hardeners, I can give it a minute or so of work time so that another part of the rig can go over it making it perfectly smooth and even.”

“That’s a wonderful idea, son. Do you believe that it will give you the strength, especially in some of the more sandy soils?”

Tom was practically sure, but promised his father to do a series of experiments to make certain that it would be a success.

Tom arrived at work the next morning to find Phil Radnor and an unknown man waiting for him in the outer office area. Trent had provided each with a steaming mug of coffee, and they sat in silence.

“Tom,” Phil said, standing up. “This is Steven Carpenter. Larry Carpenter’s father.”

Tom looked at the man whose son had recently threatened his life. “You’d better come in, I suppose,” he told Phil and their guest.

Motioning them to the chairs in one corner of the spacious office, Tom poked his head back out the door. “Trent? Please hold all calls except from my father or Bashalli.”

“Now then, Mister Carpenter,” Tom said, sitting down opposite him. “I don’t want to sound churlish, but have you come to threaten my life or my family?”

Looking ashamed and barely able to meet Tom's eyes, Steven Carpenter cleared his throat before speaking. "Mister Swift. I've come to apologize to you for my son's behavior the other day. And, on Saturday night. I really don't know what to do or say." He stopped, looking up at Tom.

After an uncomfortable silence, he continued. "Well, yes. I guess I do know what to say. I did some pretty dumb things back in my youth. I had to pay for those both with jail time and then years of having to work small and menial jobs because I couldn't get good work with my criminal record."

He stopped again.

"Mister Carpenter," Phil began. "Tell Tom what you told me on the phone and when you arrived, please."

Carpenter laid out his story. His wife had left him when Larry was only one. Bouts of drinking had led to him ranting about how his life had been ruined, beginning with his attack on the Swift property.

Unfortunately, the only thing his son came away with was the impression that everything bad that happened to the Carpenter family was the fault of the Swifts.

As the years past, his inner rage had grown.

"But, he has been a friend to my sister these past couple of years. She wanted to invite him to her graduation party, but—"

"I know. My past came back to haunt him. I'm pretty sure that's what pushed him over the top. I am so sorry. I can't imagine how angry you all must be. I'm sorry. Truly sorry." His voice trailed off.

Phil remarked, "You realize that it is now out of our hands, don't you? I mean, he is looking at some prison time for both his blackmailing of Barry James to sabotage one of our projects and for his threatening of the Swift family's lives."

Steven Carpenter sadly nodded. "I want you both to know that I bear no ill will toward Swift Enterprises or the Swift family. I take full responsibility for my actions all those years ago."

A few minutes later, Phil escorted him back to the main gate. Tom had suggested that the Carpenters seek counseling for Larry's anger. "It may help with any sentencing he receives."

Two days later he demonstrated a miniature version of the foam spraying and forming device for his father and the team of Enterprise engineers that would design and build the full-size rig.

Tom set up one of the inflatable Quonset-type buildings he

originally designed for their first South Pole trip. Measuring 60 feet long, 22 feet wide and 15 feet high, he felt that it would be a good substitute for an underground tunnel.

After explaining what he hoped to accomplish, Tom pressed the coded key sequence on his portable controller and the small machine went into action. As it entered the open-ended building a set of curved paddles extended out to within an inch of the structure. As it crept forward, the crowd could see dozens of nozzles built into the leading edge of each paddle extruding out the white foam.

When the craft pressed forward, they could plainly see the foam had been evened out by the back of the paddles into a seamless, perfectly smooth surface.

Tom walked up behind the machine as it continued forward and tapped the surface of the foam. He turned with a big grin. "Totally hardened and almost glass smooth," he declared. Everyone moved forward to touch and press on the new tunnel coating.

"Amazing work, son," his father complimented him. "What's next?"

"Well, first I want to finish the full length of the building..." he looked at his watch and did a quick mental calculation, "...which should take another ten minutes or so. Then I'll take down the outer building and subject the foam to a series of stress tests. I guess we'll all know the results in three or four days."

With a pat on Tom's back, Damon Swift excused himself and left for a meeting. The rest of the team surrounded Tom and began asking all sorts of questions. After a few, he begged off saying, "Let's have a full-scale team meeting tomorrow morning. We can meet out here. I'll have facilities deliver chairs and a portable white board."

"And snacks?" someone asked.

"And, Chow will provide snacks!"

After deflating the building, Tom used a long-armed lifter to raise the hardened shell so that he could slide the Quonset off without having to damage it.

Once he set the hardened archway back down, he climbed out of the cab and onto the extended arms, allowing him to jump onto the top of the shell. He stood there for a moment and then began jumping up and down.

"New type of bouncy castle, Tom?" Bud yelled at him from fifty feet away.

Tom smiled and motioned Bud to come over. "Climb on up here. Might as well put more weight on this." Bud quickly climbed up the lifter and walked out to the end of the lifter arms. He jumped next to Tom.

"Wow. Pretty solid, I'd say," he remarked. "I kinda thought it might be springy."

"Can't be, Bud. And, can you tell me why?"

Bud pondered the issue a moment and then brightened. "I'd say that if it was springy that it would allow any pressure from the surrounding rock to bend it in or even crush it. Right?"

"Ten points out of ten."

The boys jumped and ran from one end to the other. The only thing either noticed was that the lightweight nature of the material allowed the entire structure to move slightly as they raced back and forth.

Tom described how he would be testing the thing. His intent was to have a crane pick up something fairly heavy and place it on top. Tom would place measuring lasers all around the structure to detect any movement, flexing or distortion.

"I need to pile on the weight. This one-inch version should be able to withstand a load of thirty pounds per square inch. That's like," he added, sensing Bud's next question, "having a refrigerator that weighs almost seven tons placed up there."

"Gee, Tom. What about in the real tunnel? How much weight will it need to hold?"

"In a perfect world, practically nothing. My hope is that the earth blasters will melt the inner rock surface and it will cool into an impenetrable shell capable of holding back everything above it."

"Are you looking at a perfect world situation?"

"In truth, more no than yes," Tom admitted. "There will be places where we are cutting through solid rock. We should encounter no problems there other than water. However, we will be going through sandy or damp clay soil in other places, like in the Mississippi River basin. There, we'll need to hold back at least five times as much potential weight."

"So, instead of a one inch layer, you'll need to put in six?"

"No. Fortunately," Tom told him, "the weight retaining capabilities of this foam should be partly exponential. For each added inch, we should see a four or five times strength ratio."

The two pals climbed down from the 'tunnel.' They took a quick walk through the inner portion where Tom checked for any cracks or imperfections.

The following day, his team arrived and the meeting began. Tom described the strength characteristics he hoped for as well as showing them a detailed USGS map of the United States highlighting the different types of rock and soil the tunnels would be running through.

There were numerous questions that Tom was happy to hear and answer. He knew that this team was keenly interested in the success of the project and would leave no stone unturned in their efforts to give him the best solution possible.

Testing on the structure went very well with no problems being detected at weights from ten pounds per square inch all the way up to one hundred fifty pounds. Tom eventually ordering a test featuring a huge steel and lead weight topping out at over two hundred pounds per square inch. The structure handled it for almost twenty minutes before beginning to sag.

The measuring laser results showed that it had withstood everything except that final weight with only fractional flex. Tom knew that his improved formula and application machine would make the tunnels safe and secure.

Without warning, and with an explosive *CRACK!* the shell exploded apart letting the weight drop to the ground where it embedded itself more than ten inches into the tarmac. Shrapnel flew hundreds of feet in all directions,

In horror, Tom looked down to see a chunk of the tunnel material sticking out of his left thigh, blood pouring out of the wound. With a sigh, he sagged to the ground.

CHAPTER 8 /

“WE HAVE YOUR FATHER!”

DOC SIMPSON'S FACE was the first thing Tom saw when he opened his eyes an hour later. He glanced around and immediately guessed that he was in the Swift Enterprises infirmary.

“Well. Hey there, Tom,” the young medico said as he bent over Tom and shone a light into the inventor's eyes. “Feeling anything?”

Tom tried moving various portions of his body. Nothing seemed to be sore or inoperative.

“No. Everything feels just fine.” He began raising himself to a sitting position before the Doctor pushed him gently back down.

“Nope. You're going to lie there for the next eight to twelve hours. You lost a couple pints of blood out there. Caused the HazMat team to respond for a biohazard cleanup and everything.”

“What happened,” Tom asked.

“As near as I can tell from the reports, your little test tunnel exploded under the strain of your tests. You were the lucky recipient of a sharp chunk directly into your right thigh. Missed the major femoral artery and veins by less than an inch. You bled, plenty, but one of the technicians that had been hanging around applied direct pressure and slowed the flow long enough for me to get to you.”

Tom's mind was racing. What might have caused the explosive destruction? The weight? A problem in the foam mixture?

He agreed to stay put until he had received a second pint of blood and a couple liters of saline. Doc Simpson promised to make the appropriate call to his father. “You will be sleeping in your own bed tonight,” he promised the inventor.

He made Tom agree to take the following day off for additional rest. “You can let your mind run rampant, but I want that body prone and relaxed! You could tear out some quite beautiful internal stitching I did in there.”

So, Tom stayed at home and allowed himself to be nursed by his sister who had just graduated from high school but hadn't yet found a job.

Tom's mother had some sort of obligation that would keep her

out of the house until about six that evening. She had been gone each day for the past week or so according to Sandy.

Once he was released to go back to work, Tom headed directly to his underground lab where he began to investigate some of the pieces of the former tunnel to see what might have happened.

A dynamic stress test showed that the foam hardened into a practically unbreakable substance except where pointed pressure was applied. Tom felt certain that this wouldn't be an issue once the tunnel had been created by his earth blasters. One thing he wanted to test was the effects of having the tunnel sitting in direct sunlight might have had on the structure.

He poured two identical 4 x 4 foot plates for his test. He stopped and thought a moment, then poured a second pair from the same batch of foam.

The first he set up to be subjected to direct sunlight. The second he placed in a test chamber where the wavelengths of light mimicked those that would be found in the tunnel. The third went into a wet chamber. The fourth would be the control sample. It went into a dark, room-temperature container.

Tom would check them periodically over the following several weeks.

He turned his attentions to the design of the engines for the transcontinental trains.

That afternoon he received a phone call from the DOT.

"Tom? This is Jonas Markham. How is the project going?"

Tom gave him a brief rundown of the successes they were having, omitting the tunnel material mishap.

"The actual reason for my call is that we just got back the final report from the FBI regarding Miss Bjorgman and her call to you ordering Swift Enterprises to stop working on the contract."

"Oh, yes. I well remember that one. What did they find out?" Tom inquired.

"Unfortunately, what they found was on the inconclusive side. She was able to provide a memo she reportedly received from me requesting that she pass that message along to you. Pretty good forgery on the signature, but I definitely did not send it."

"Could they tell who might have, sir?" Tom asked.

"They have their theories, but they can't prove anything. As it stands, she might have written that memo, or she could be the innocent victim of some other person out to get you folks and the

company down in Texas.” The Secretary passed on another piece of information that Tom had expected.

He thanked the Transportation man and hung up. He called Harlan to report the findings, and Ames offered to request a copy of the FBI’s report for his own files.

“While I’m at it, I think it is time I looked into this for myself. Do you agree?”

Tom did and told his Security chief as much. “Just keep me in the loop, please. Probably no need to bother dad. He’s so busy on three different projects right now.”

After hanging up, Tom put in a call to Arv Hanson and to Hank Sterling. They arrived at his office ten minutes later.

“How’s that replacement shell for the engine coming?” he asked.

Arv replied, “Great. I’ve made four of them. Harlan’s taking one and will be creating the basic pattern pieces for any other scale and the full-sized models.”

Tom turned to Hank. “Did I give you a set of the designs, Harlan?”

“No. But, you put them in the design system and opened access to me. That’s probably even better. I’m going to CAD all of the pieces over the next couple of days. Just make sure that you flag any changes, please.”

“I’ll do that,” Tom promised. “Now, the reason I wanted you both here is because I have a feeling—perhaps a strong indication—that we are going to have something else on our plates. Very soon. You’ve both seen the basic design for the freight cars, right?”

They nodded.

“Well then, I just received word that the company up in Canada that is—or, was—supposed to be building them from our designs has just gone into what they call receivership.”

“That’s like our bankruptcy protection filing or something, isn’t it?” Arv asked.

“Sort of. As I understand it, they are broke and owe a lot of money, so the government regulators have kicked out all of the senior management and have replaced them with a team of people who will either figure out a way to bring the company back from the brink, or will devise a scheme to liquidate it to pay off debts.”

“I thought that the U.S. Government payments would have been sufficient to keep them afloat. What happened?” Hank asked.

“The best I can tell is that the money was mostly used to pay off their oldest debts leaving almost nothing to spend toward building the cars.”

He told them that either the DOT was going to need to find another manufacturer for the cars, possibly a company in Brazil that made trains for all of South America, or that Enterprises might need to pick up that ball.

“I’ve already asked Jake over at the Construction Company if we can do this. He says that the fewer parts he needs to assemble, the easier it will be for him to agree to take it on. I need to know what you two think.”

Hank was the first to speak up. “Realistically, skipper, the freight box could be made from just four pieces. Two shell halves and two doors. It might be tricky and the molds would have to be built with maybe one-millimeter tolerance, but it’s doable. I’ll work with Arv to come up with a mini version to try everything out on.”

“What about the trucks and wheels?” Tom asked.

“My guess is that the trucks can be made like model airplane parts. Probably using magne-titanium for strength. Upper and lower halves that snap together—with an adhesive—and then the wheels and bearings popped on. Of course, we’ll make things so that they can be taken apart, but only when we want them to.”

“What did I hear about some sort of levitation gear?” Arv asked.

Tom told them about the variation in the G-force inverter technology. “I believe that we are talking about a module the size of a small picnic hamper that would be slid into a bay on the underside of each car, plus the wiring harness and transmitter equipment.”

They all agreed that a 1/16th scale mold set should be made so that everything could be tested out.

“Assuming that we can make things fit and work,” Hank stated, “is there any reason that Jake and the folks over at the CC wouldn’t be able to crank the cars out a couple per day?”

Tom smiled.

Neither of them could know how successful this manufacturing system would prove to be.

Activating his intercom, Damon replied, "Yes, Trent?"

"Mister Swift? I have a gentleman from the Nuclear Regulatory Commission on line three. Can you take it? He wouldn't give me his name or any details about the nature of the call."

"Put it through, please." He sat back pondering who might be calling and what it might be about. When the phone buzzed, he pressed the button placing the call on speakerphone. "Damon Swift. To whom and I speaking?"

"Mister Swift. My name is Stephen Oppenheimer. I work for the NRC commission steering committee. I report directly to the Chairman Commissioner, Mr. Jardorff. I know you are familiar with him."

Damon knew the current Chairman very well. They had been students together at MIT many years earlier. "Of course. How is he?"

"Oh, he's fine. Just very busy what with all of the new requests for permits to build this new generation of nuclear reactors and energy plants."

Damon Swift was also very familiar with these new reactors. He and Swift Enterprises had designed and tested the concept out at the Citadel. "What can I do for you folks?" he inquired.

"Mister Swift. We have, frankly, run into a problem with the first of these new reactors. As the contractor is constructing the reactor core, questions have been popping up regarding tolerances and this new cooling system of yours. Is there any way we might get you to come out to the site in Idaho?"

Damon cleared his throat. "Well, as you know I stand ready to assist the Commission in its endeavors, but I am heavily involved in another project right at the moment. When would you need me and for how long?"

"Just a minute." His caller placed a hand over the receiver and was speaking with someone else. Thirty seconds later he came back on. "I was just asking the Deputy Commissioner. He said that we would appreciate it if we could pick you up the day after tomorrow and fly you out there. He believes it should be only for the day and that we could have you back in Shopton late that evening."

Damon requested a minute and placed the call on hold. He consulted his computer, checking his schedule. Then, he buzzed Munford Trent and asked if there was anything that couldn't be rescheduled for that day. Receiving the answer, he picked the call

up again.

“It appears that I can rearrange my schedule for that day. I can be ready by eight. If you can provide my secretary with the appropriate info regarding your aircraft, he will arrange for clearance to land here at Enterprises.”

Damon Swift transferred the call back to Trent and went back to his previous activity.

Two days later a sleek 8-passenger jet with civilian markings landed at Enterprises just after 8:00 a.m. Mr. Swift met them at the small general aviation building located near one of the east-west runways.

The young man who exited the craft was Amer-Asian or Eur-Asian. He was tall, but with slightly slanted eyes and straight, dark hair. He introduced himself.

“Mister Swift? I am Peter Wong, assistant to Stephen Oppenheimer. Mister Oppenheimer sends his regrets but he was called away at the last minute. I am here to take you to the facility where we hope you can get everything back on track.”

Shaking hands, Damon Swift noted that the man had slightly cold fingers and a sheen of perspiration on his upper lip. *These*, he thought, *are the signs of a nervous man*.

Mentally, he shrugged and invited the man into the terminal.

“Actually, I’d prefer if we could get on our way,” Wong replied. “So much to do, you know...”

Damon excused himself to make a quick phone call and promised to be aboard within the next several minutes. He went into the terminal building while his host returned to the aircraft.

“Harlan? Damon. Listen. I told you about the NRC trip, right. Anyway, someone I have never heard of is here to take me out to Idaho. He seems a little nervous, something I wouldn’t expect. Could you get on to the FAA and national air control to make sure they track our flight from the moment it takes off?”

“Damon. If you think there is going to be trouble...”

“No. I just have a little nag at the back of my neck and would feel better if everyone were watching. You know?”

Ames agreed, adding, “Do you have your miniature radio pen? Just in case?”

Damon Swift did and said so. “I really don’t believe anything is out of the ordinary, but I just wanted to... I guess I just wanted to make sure you have my back.”

“Always do. Take care and get back to me once you land, okay?”

Damon agreed and hung up. He picked up his briefcase, which held his small notebook computer, and exited the building. He climbed the short set of stairs and ducked as he entered the jet.

Stephen Wong was sitting in one of the front seats. He motioned Damon to the other. Once seated, Wong pressed an intercom and told the pilot to take off.

They passed the first hour in silence. Damon occasionally looked out the window but rarely could see anything. He pulled out his laptop computer and turned it on, hoping to do a little work. At first everything seemed fine. He used a special GPS-based widget to check their current position. He was surprised to see that they had crossed over the Canadian border and were heading almost due north.

When he asked Wong about this, the man broke out in more perspiration before stammering, “You... you’ll get there. We’re just taking a new... a northern route, Okay?”

Damon narrowed his eyes but turned back to his computer. He tried to surreptitiously open his email program to send a message to Harlan.

Alerted to his passenger’s interest in their flight path, Wong leaned over to see what was on Damon’s screen, and immediately reached out and snapped the cover shut.

He pulled a gun from inside his jacket and pointed it at the inventor. “Okay, Swift. I thought we could keep this up for a few more hours, but your curiosity got in the way. Put the computer on the floor and give it a good kick to the back of the jet.” He waved the gun near Damon’s face for emphasis.

“Who are you and where are you taking me?” Damon demanded.

“Who we are is a group of freedom fighters who have been suppressed by western industries like yours for too many years. We intercepted your contact with the U.S. nuclear agency and knew that now was the perfect opportunity to grab the famous Damon Swift! My mi—my master will be well pleased.”

He sat back, gloating over his success. Turning, he continued, “Where you are going is of no concern to you. What should be of concern is that we intend to release you only under one of two possibilities. Either your country supplies us with five billion U.S. dollars plus six stealth fighter aircraft, or else *we return your corpse!*”

CHAPTER 9 /

DESERT TRIAL

HARLAN AMES was almost apoplectic. The report of the jet's flight path had alarmed him at first. He had contacted the U.S. Air Force to see if a fighter jet could be sent to investigate and to turn the suspect jet back from its current northerly course.

Next, he had contacted the TCCA, Canada's version of a combination Federal Aviation Administration and National Transportation Safety Administration. He informed them of the potential for an international kidnapping. They promised to respond immediately.

What happened next made his blood run cold. The IFF—the automatic transponder that sent, or 'squawked,' an aircraft specific identifier code—for Damon's jet suddenly went dead. That meant that the aircraft had either crashed or the pilot had taken the extreme measure of shutting it off.

"Are they too far north, or do you think the Outpost might be able to pick them up?" his second in command, Phil, asked.

"Great idea. Call the radio room and get us connected pronto. I'll talk to—" he paused, trying to think who was in command this time of year.

"Ken Horton is back in command. Went back up last week," Phil offered.

"Right. I'll talk to Ken."

The call was put through in under two minutes. Harlan explained the situation to the commander of the Swift's outpost, high in geosynchronous orbit.

"We'll give it a try, but the curvature is going to work against us if they get within ten degrees of the pole," the man told him. "I'm having the megascope oriented so that we can scan eastern Canada. Should be just about three minutes. What is their last known position and their course and speed?"

Harlan consulted his notes and read out the information. "Ken. Please impress on your team that Damon Swift's life is in jeopardy. Speed is important."

Moments later, Ken Horton reported that they could detect no aircraft in the area corresponding to their approximate position. He told Ames that they were widening the search.

“It may be that they took off on a tangent as soon as they shut off their IFF,” Ames told the station commander. “My guess is that they would head west to try to get lost. Have the scope look due west of their earlier track.”

“Harlan. They may have just set down. Could be for a problem, could be on purpose. We’ll keep scanning and widening the search to account for additional time. I’ll get back to you as soon as we find anything.” With that, Harlan heard the line go dead.

He called Tom.

Once he heard the news, Tom rushed over to the Security offices. Ames told him of everything being done. “Should we let your mom know?”

“No. Not just yet. And, I’ll call her when it comes time. How soon do you think Ken might call back?”

“It’s a huge area to search. I’m hoping that the Canadians can find something to look at with their RADAR.”

“I’m going to see if I can get permission to enter their airspace with the *Sky Queen*. Even if I don’t know where he is, at least I’ll be closer and can maybe help.” With that, Tom rushed out of Harlan’s office and over to his own.

The TCCA officer listened to his request and then placed Tom on hold. When he came back on, he was extremely cordial.

“It appears, Mister Swift, that the TCCA owes you a favor. When you had your unfortunate accident over our country, your rescue team was not treated professionally or particularly well. I apologize for that and grant you full and immediate access to our airspace.”

While this conversation was going on in Shopton, Damon Swift and his captors had set their jet down on a little-used airstrip in western Quebec. Given the amount of travel time and their previous heading, he guessed they must be near the Hudson Bay, probably a hundred miles from anything.

Trying to keep his voice soft and non-threatening, he asked Wong, “So, who are you, really, and why do you want six fighter jets?”

Wong swung to face him, his features twisted into a masque of rage. “Why? *Why?* I will tell you why. Your son destroyed six of our jets in a cowardly attack over the South Pole!”

Damon knew that the man was referring to a time when Tom was working to repair the ozone layer over Antarctica and had been attacked by six mysterious black MIG-style fighters. Only a

surprise intervention by the U.S. Air Force had driven them off. Several of the black jets had gone down in flames from the fight while the others raced from the area. Their pilots had all crashed their jets into the ocean.

“I would guess that Wong isn’t your real name. Is it? Are you perhaps Korean? North Korean?”

That question struck another nerve and the gun swung up pointing at his face.

Now was not the time to press the irrational man for any information, or to try to correct his version of the story. Damon faced forward again and considered his options.

He believed that his one hope might lie in being able to use his secret pen radio. If he could just manage to reach it and press the beacon button.

Damon formulated a plan. Stephen Wong—if that was his name—kept his gun pointed directly at Damon’s chest and his eyes on Damon’s face. Any overt movement was sure to arouse suspicion. So, he slowly, almost absently, reached his right hand over to his left and scratched an imaginary itch.

Seeing no reaction from Wong, he paused but left his hands together.

A minute later he picked up his right hand and began scratching his wrist. He moved his jacket sleeve up and scratched lightly at his lower arm.

This finally got Wong’s attention.

“Stop that,” he ordered.

“My arm itches. I need to scratch it,” Damon informed him.

Looking squeamish, Wong told him, “I don’t like it. Go to the rear of the plane if you have to do it.”

Damon was elated but strove not to show it. He unbuckled his seatbelt and began to rise.

“Hold it! Let me check you for weapons.” Wong made Damon slip out of his suit jacket, then patted him down with his free hand. Finding nothing that might be a weapon, he motioned the inventor to get away from him.

Damon turned and walked slowly the ten feet toward the back of the cabin. As he passed the halfway point, he reached up and pressed the top of his radio pen three times. This would, he knew, activate the emergency beacon.

He made a great show of scratching all up his arm and across

his shoulder. A minute later he returned to his seat. They sat in silence for twenty minutes until Wong pushed himself up from his seat and opened the door to the cockpit.

Damon could hear their voices speaking in a language he didn't recognize. A moment later, Wong returned and motioned Damon to get up.

"I am getting out to stretch for a few minutes. I don't trust you, so you come with me."

He activated the door and stairway, and they were soon standing upright and stretching, just in front of the left wing. The aircraft cabin had been at least ten inches too low to allow either of them to move about without bending.

Okay, Tom, Damon thought. I hope you're already on this. I'm not sure we'll be here too much longer.

Tom had performed just about the quickest preflight checks on the *Sky Queen* ever and was winging his way toward Canada within ten minutes of receiving permission. Pouring on the speed he was soon traveling at more than 1,100 MPH.

He radioed Quebec Central with his flight details and a request for a course close to the one he believed his father's captors took.

Although the controller made Tom repeat his speed details and seemed very surprised, he gave Tom permission to travel on his present course all the way to the northern Canadian border if necessary.

Slim Davis, who had been the only other pilot available on extremely short notice, spoke up.

"Skipper? I've got your dad's emergency beacon coming through. Just sort of showed up."

"What vector?"

"Uh, left nine degrees. Pretty close to their original course."

Tom made the slight course change. "That type of jet generally makes about four hundred eighty knots, and we lost the signal an hour and ten minutes into their flight. That would mean—" he did the mental math, "—that they would have traveled about five hundred sixty miles. They might have set down anywhere in a hundred mile radius from that. We should be just about at the point where they stopped broadcasting. Is the signal changing?"

Slim consulted his instruments. "Nope. Dead ahead now." He watched his readout for another twenty minutes and then shouted, "Tom, the signal just flipped one hundred eighty degrees. We flew right over them!"

Tom immediately dropped his speed and sent the giant jet in a tight turn. “Got the GPS position of that point?” he asked.

Slim had written it down. He gave the page to Tom who punched it into the navigation computer that would take them directly over that point.

At 50,000 feet, Tom felt sure they would remain undetected by anything on the ground. He slowed their speed to a crawl once they neared the coordinates. Asking Slim to take the controls, he moved back to the SuperScope control station. This combination ultra-high definition video camera and computer enhancement system could focus on a point from their altitude giving them the same quality of picture as one might expect when viewing something the size of a city bus from only one-hundred feet away.

“Got it!” he cried out. “Notify the Canadian authorities of the position and then get on to Harlan.” He scanned around the jet and soon spotted Stephen Wong. He looked farther around and finally saw his father. He moved the focus back to Wong and could now see the gun in the man’s hand.

His suspicions were correct. His father had been taken prisoner.

The Canadian Air Force reported directly to Tom that they had dispatched a pair of CT-155 Hawk jets. Their subsonic speed would mean they would arrive from Montreal in little more than an hour. Tom knew he couldn’t wait. At any minute his father could be forced back into the jet and it could take off. Besides, the Canadian jets were generally used as trainers and for the Snowbirds flying demonstration team. Few were armed. They would be of little assistance.

Tom reduced the thrusters and the jet began to drop. He intended to allow it to drop to about 2,000 feet before applying the lifters to both slow their decent as well as to—hopefully—pin the enemy jet to the ground.

He entered some additional element information into the repelatron’s control computer. He hoped that by adding aluminum, the jet on the ground below would be trapped.

It wasn’t until the *Sky Queen* had applied full breaking thrusters that either Damon or his captor looked up. The *Sky Queen* appeared to be plummeting directly toward them. While Wong’s attention was focused on the *Queen*, Damon knew he had to try to overpower the man. He rushed forward and tackled the man, ramming his shoulder into his midsection.

Wong went down without a struggle. His gun had been dropped a few feet away so Damon simply got up and picked it

up.

“Hold it!” The voice had come from behind Damon. He turned and saw the pilot coming down the stairs, holding a gun. Both of them heard the wrenching metal sounds as Tom’s repelatrons bore down on the aluminum structure of the jet.

First to go were the wings which bend like wilted flower petals. Next, the tires all blew as the enormous weight pressing down overpowered their ability to hold air.

The other man dropped his gun and raised his hands. Damon motioned him to move over next to Wong. Holding the gun on them both, he took his radio pen from his pocket. “Tom, it’s Dad. All safe and handled down here.”

Overcome with joy, Tom could only croak out, “Good. We’re coming down next to you.”

While Slim locked the two men in a small compartment, Tom and his father went up to the cockpit.

They radioed the TCCA and Harlan as they headed for home. As the kidnapping had started over U.S. territory, the Canadian authorities ceded prosecution rights to the U.S.

That evening, Damon related an abbreviated version of his ordeal. This was the first either Sandy or his wife, Anne, had heard. “Not to worry dear. Tom and Harlan had everything well in hand almost before the jet took off from Enterprises.”

“Hey, Dad? I’ve got a question for you,” Tom said to change the subject.

“Shoot, Son.”

“Okay. I need to spend about a hundred thousand dollars on a test track and scale model of the trains. Will the budget stretch that far?”

His father considered the matter and then replied, “Can’t you do a full-scale simulation in the computer, Tom? It isn’t that we can’t spare the money if it is *really* needed, but—”

“I’m pretty sure it is,” Tom stated. “See, I’ve run a simulation and I’m not satisfied that I’m getting real-life data back.”

They discussed the matter while Sandy and Anne left the room to go watch TV.

The next day Tom began the preparations for his test. He started by calling Arv Hanson.

“What’s up, skipper?” the big Swede asked.

“Dad’s given the OK to build a scale model and a test track, Arv. What I need is a train at one-thirty-second scale and you’re my model man.”

“Just the engine, Tom?”

“No. Actually, I want two engines and forty cars. Plus twelve miles of scale track.”

Arv whistled. “Big order. Have I got more than a week to pull this off?” he asked with a grin.

After further discussion it was decided that the test would take place three weeks later. Arv would use a vacuum-molding machine to create polycarbonate outer shells and the undercarriages. He promised to have scale loads installed in all of the cars as well as creating a high-speed drive system that would run off of several Swift solar batteries to be located in the first three cars at each end of the train.

After Arv left, Tom made a call to the Bureau of Land Management in Utah and spoke with the Bonneville Salt Flats coordinator. She faxed the necessary forms to Tom’s office and cleared the schedule for a five-day period to accommodate the installation, running and dismantling of the test track and train.

Good to his word, Arv called Tom the following afternoon and asked the inventor to come over to the model shop.

“It isn’t painted yet, but I was able to get a good form for the engines by using the 3D printer we have over here. Ran it all night long, but it was finished by the time I got here. What do you think?”

Tom smiled at his model maker. The engine shell was a perfect scale replica of the train engine, just over two feet long. “What did you do the shell from?”

“That’s a high-strength polycarbonate, skipper. If it sails off the track and hits something, it will most likely crack, but it shouldn’t shatter.”

They walked to the next room where the 3D printer was busy creating the mold piece for all of the cars of the train. “She’ll be ready after we go home, but I’ve got one of the engineers coming in at four in the morning to get the thing out and the first couple car bodies formed.”

“And the trucks?” Tom asked referring to the undercarriage and wheels.

“We’re having to make those of Durastress. Polycarbonate wouldn’t take the stresses or the heat,” Arv explained. Seeing

Tom's look, he added, "But you already knew that. Right?"

Tom nodded.

Sixteen days later almost everything was packed into one of the large-capacity cargo modules inside of the *Super Queen* and flown out to Utah. The battery cars were a little behind schedule and Arv had only managed to complete four of the six. He would have the final pair on site the day before the test.

Because Arv had built a quick-connect feature into the tracks, it took only two days to complete setting out the entire run. It was secured every ten feet with a special spike that was hammered into the ground and then given a quick turn to lock it into place.

Tom's parents, along with Sandy, Bashalli and Bud, arrived the evening before the scheduled test. They brought along the missing power cars.

"Everything ready, Son?" Damon Swift asked.

"Yes. We got the track together yesterday and ran one of the engines along it at a scale ninety miles per hour." He grinned a little sheepishly, then admitted, "We had a little 'oops' moment when the engine got airborne and left the track. Luckily Arv packed up a few spare body shells."

"What happened?" Tom's mother asked.

"Well, we got a little lax when we laid out the track. One of the sections didn't get hammered down solidly and it popped up at one end. The engine went over that and—" he made an upward swooping motion with his hand, "—up she went."

"I am certain that you have that all *nailed down* now," Bashalli told Tom with a grin.

He took them over to see the track and the train. Even at its small scale the train stretched almost eighty feet from end to end.

"How fast will it go?" Sandy asked.

"We can get it up to a top speed of two hundred in about the first half mile of track. Then we'll run it for ten miles and use the final mile and a half to stop it."

"Do you mean scale speed?" Sandy asked.

"Not for this train. We need to see how air density and dynamic pressure build-up and all of that affect it. At a scale-related speed we wouldn't get real data. Each car is outfitted with scale loads varying from the equivalent of hauling an empty car or two—very unlikely, but we need the data—up to a car loaded from top to bottom with the maximum cargo load."

The next morning, all was ready for the first of the four test runs Tom wanted to make. As he stood by the control panel his sister came up to him.

Looking out across the salt flats she said, “You know, Tomonomo? One of these days I bet you’re going to be out here driving faster than anyone ever has or ever will.” She hugged him.

Chuckling, Tom replied, “That may be your dream, San. Not mine. If you think a Swift should break the speed record out here, I give you my whole-hearted approval and I’ll even help. But, I prefer my speed-rush to come in the air or in outer space.”

“I may hold you to that promise,” she told him before going back to where their folks were.

Bashalli came over and gave Tom a hug and a kiss. “I only wish that we could see all of this, Tom,” she mentioned.

“Oh, you can. I’ve got a high-definition camera in the engine cars. Bud just went to the *Super Queen* to bring back the monitor so we can all sort of ride along.”

The first test was made at a relatively slow speed of 100 MPH. Everything went smoothly, so Tom decided that the return trip would be stepped up to one-fifty.

“Can’t you run the model at slower speeds?” his mother asked. “Watching the monitor is making me dizzy.”

“We can only get scaled down results if we do,” he told her. “I need to know how aerodynamic the design is running at actual speed.”

The small crowd of family, friends and technicians were thrilled as they watched the return trip as seen through the eyes of a miniature train engineer.

When the time came, Tom pressed the ‘brake’ button. Although the train began to slow, a glance at the readouts showed that it wasn’t slowing enough.

Something was going wrong. Tom reset the computer program and tried the braking system again. This time it worked bringing the train to a stop a mere two hundred feet from the end of the track.

Tom turned to the group to explain what might have happened when he was thrown off his feet by a violent explosion that ripped through the front end of the miniature train.

CHAPTER 10 /

GO, SWIFT RACER, GO!

“IS EVERYBODY okay?” Tom asked as he rose. He sprinted over to Bashalli who had been knocked backward. Helping her to her feet he glanced at the rest of the people there.

Everyone seemed to be fine, just a little shaken and dirty from the mysterious explosion.

Motioning them to stay, Tom and his father approached the wreckage. With dismay, Tom saw that the first ten cars along with the lead engine had been shattered beyond recognition.

“Do you smell that?” his father asked.

Tom took a sniff. “Plastic explosive of some sort. Somebody rigged the train to explode!”

His father shook his head sadly. “That means someone back at Enterprises must have slipped a bomb into one of the cars.”

They agreed that the only thing to do was to pick up everything and pack it all back to Enterprises. As the technicians set about that work, and aided by Bud, Sandy and Bashalli, Tom and his father took several samples of broken train back to the laboratory in the *Super Queen*.

It took only minutes to identify the explosive.

“It’s TVAREX 4A, Dad,” Tom exclaimed. “Comes mostly from Slovakia, although I think I read that a Canadian firm was experimenting with it for mining purposes.”

“That’s nasty stuff, Son. I’ve got to call Harlan to tell him about this.” He left Tom alone in the lab.

A knock on the door roused him from his thoughts. It was Bud, Sandy and Bashalli. “Hey, skipper. We decided that the techs are better equipped to pull everything up. What say we all hop into the jet we came out in and go back home?”

“Perhaps,” Bashalli added, “you can help Mr. Ames in his search for the culprits. Besides, I am going to need to get somewhere that I can sit in a bucket of ice. My bottom is going to be black and blue for weeks!”

“You’re probably right. I’ll grab some of the control stuff and a few more samples and then we can go.”

Three days later Harlan Ames called Tom. “I think we know

how the explosives got into the train, we just don't know how they got *into* where they were located."

Tom asked his security chief to explain.

"Well, we found the remnants of all three of the solar batteries. After we tested them, it turns out that one of them was full of the plastic explosive. We also found what looks like a piece of a timer/detonator. My guess is that whoever put that stuff in there didn't have any idea where the train might be when it went off."

"If the braking system had worked right, it would have stopped a lot farther away. Looks like we had some bad luck. But, any idea how the explosives got into one of our batteries?"

"No. That's the unknown part. Here's the scary part. That particular size battery is used mostly in the Toads. Arvid just grabbed the first six batteries from the warehouse that would fit into the model rail cars."

Tom considered the new information. "Have you taken everyone out of that warehouse?"

"Phil is working on it right now. I've got a bomb disposal unit waiting outside of the building. If there is another one in there, they'll find it!"

"Do you have any angle on the source of the explosive?" Tom asked.

"Well, as you know it is pretty much confined to Eastern Europe with a little coming into North America for mining purposes. All we can find so far is that none of the Canadian stuff is unaccounted for. That means someone from Slovakia, or some terror group, smuggled it into the U.S. And, that's not good!"

* * * * *

"I've got a question for you," Tom said to Bud when the latter walked into The Barn that afternoon.

"Okay. Shoot!"

"Well, people are going to need a way to get from each digger out to the nearest exit point. Mostly for shift changes, but also in case of any emergency. At first, I thought that we could just use trucks or even electric cars. Now I think that may not be the best solution. Any thoughts?"

"What sort of distances are we talking about? At most, I mean." Tom thought a moment and then replied, "Somewhere between zero and a couple hundred miles."

"I'll assume that you don't want to take several hours to get

from point A to point B, right?” Tom nodded his agreement. “Then you need a high-speed service car. You could run it on the rails. Sort of a twenty first century pump-handle cart.”

Intrigued, Tom asked for more detail.

Bud looked at him and then said, “You’re laying the tracks and all directly behind the TBM. They are all nice and hard and ready for use within five minutes of being extruded. Why not create a people carrier, maybe room for six or eight that runs on those rails? Since you wouldn’t need to steer it, it could run really fast, just like the trains will.”

“Now why couldn’t I see that?” Tom asked, amazed at his friend’s solution. “We could use our little Y-4 engine and run the things at about two hundred MPH. Never more than an hour away from an exit. Perfect!” He slapped Bud on the back.

“So, now you owe me a great steak dinner, right?” Bud asked. “Or even a *pretty good* one... for two?”

“Buddy. I’ll buy you and Sandy and Bash the best steaks in Chicago’s best steak house after this.”

He and Tom spent the next several hours at a design terminal as they tried several possibilities for such a rail racer. Finally, Tom stood up and admired their work.

“Eight seats, better than two twenty speed, and very stable. I’ll even include a heater so that people travel in comfort.”

“What?” Bud looked shocked for a moment. “Not a convertible?” He couldn’t hold the straight face and soon both boys were chuckling.

“I know you too well, Budworth Barclay. You’d want to poke your head up and the wind would just about take it right off. No. This one will be totally sealed. Low noise and no windows to open, either.”

Their design looked like a sleek, long and low-slung race car. It would straddle a set of tracks with each side overhanging the rails so that the center of gravity could be kept low. Two drivers would sit low and between the tracks in front with two raised rows of three seats behind and a storage area behind them.

The small but powerful Y-4 engine would be housed under a cowl between the two drivers. Connected to a constant velocity transmission, it would allow the small vehicle to accelerate to top speed in under twenty seconds. Tom decided to outfit each one with high-temp ceramic brakes capable of withstanding the enormous force and heat involved in quickly stopping from that speed.

He turned the plans over to Arv Hanson, Enterprises chief model maker and the man responsible for creating many of the full-sized prototypes of Tom's inventions.

How about a magnetanium chassis," he suggested. "Keep the weight down."

"Actually, Arv, weight savings is not what we want lower down on this," he explained the need to keep the center of gravity fairly low. "It's old school, but I'd suggest steel for the chassis and then Durastress or Tomasite for most of the outer pieces."

Hanson promised to have a non-running prototype within two weeks. "We'll do the basic forms in the CAD system and then let the component printer make the pieces."

This machine could take any 3-dimensional drawing and turn it into a fully rendered 3-D piece. It worked by creating layer after layer of a hard-setting plastic to an accuracy of one-thousandth of an inch.

Only a slight hand polishing was necessary to create a shiny, curved piece. And, pieces could be produced in one of six colors or even perfectly clear. Arv had asked Tom to invest in one a couple months before and was anxious to put it to better use than just creating scale models of finished inventions.

It is what Arv had used to create the molds for the ill-fated test engine and cars.

Tom asked Bud to supervise the construction of the framework and body. "I'm going to be too busy to attend to any of the details over the next week," he had told his friend. "Make sure that everyone realizes that the chassis needs to be absolutely straight and balanced. Straight to within a quarter millimeter front to back and side to side."

So, as Tom attended to work on his giant digging machines, Bud worked closely with a team of fabricators and soon had the basic frame of the rail racer complete.

He met with Arv on the third day to inspect the different body panels. "These look great, Arv. I love the smoked color of the lower body and the totally clear upper parts."

Arv grinned. "Yeah. I thought that would make a nice combination. I'm also going to lay in a stripe of color on each one."

He pointed at an indented area on a lower body panel.

"I was going to ask about that," Bud said. Why color, other than to make them flashier, that is?"

“Tom wants us to build four of these eventually and wants a way to quickly tell which one is which. Instead of putting numbers on the sides and the top, one will get blue stripes, another gets red, and the final two will be yellow and green.”

They each picked up a side panel and headed over to where the chassis was almost complete.

Asking one of the welders to take a break, Bud and Arv fitted their panels onto the chassis. Quick-fit pins substituted for the eventual bolts and allowed them to step back and admire the work.

“Jetz, Arv,” Bud exclaimed, rubbing his hands together. “I can hardly wait to get behind the... uh, these don’t have wheels, do they?”

“I haven’t seen what Tom has cooked up for controls, but my guess is that they will not have steering wheels. Kind of like adding a parking brake to a cow.”

They asked the chassis team what they thought of the panels and were happy to hear only praise. After removing the temporary panels, the two headed back to Arv’s workshop to retrieve the others. By the end of the day, the chassis was complete and the only thing left to add to the now-finished body were the colored stripes and the doors.

Knowing how busy Tom was, Bud called to see if Mr. Swift might be able to come inspect the work. Damon said that he would be there within the next ten minutes.

Walking into the assembly shop, Damon Swift had to stop and take a moment to admire what he saw. “Just beautiful, Arv. Bud. My understanding is that Tom is going to use these to transport the digging teams back and forth during the build phase, and then they will be turned over to the railroad to be used as high-speed inspection and potential rescue vehicles. Right?”

They nodded.

Chuckling, Damon added, “I only hope that Tom lets me take a spin in one of these before they go away.” He slapped Bud on the back and shook both their hands before returning to his office.

“Looks like we have a winner,” Arv grinned at Bud.

“I only hope that whatever Tom is putting on the inside will be as sleek and flashy.”

Tom did, indeed, have something flashy in mind. And, three days later he came to inspect the rail racer now outfitted with one of his small yet powerful Y-4 engines plus the interior seating.

“You know the all-glass instrument panels we have in our newest planes? Well, this is going to get a small variation on that.” He described a curved glass instrument and control panel that would wrap around the front of the cockpit.

“It only needs to be about six inches high. All we really need to see are basic engine readouts, speed and fuel level. But, I’m also going to add a vibration sensor plus a RADAR readout. No amount of light is going to penetrate far enough ahead to warn of potential hazards we might encounter at top speeds, so a narrow-focus RADAR beam will probe ahead and show up on the center portion of the panel.”

Before leaving, Tom promised to have the panel ready the next day. “It won’t have all of the instrumentation programmed into the computer yet, but it will be able to be mounted and prepped for use.”

Seeing Bud’s slight look of concern, he added, “Oh. And it will be mounted so it can be swung up to allow for easy access behind it.”

Bud nodded and mouthed a silent, “Thank you.”

The following Monday, Bud and Tom flew out to inspect the proposed site of the entrance to the longest of the tunnels that would be constructed. It would stretch from a point northeast of Salt Lake City, Utah, all the way under the Rockies with its corresponding exit point northwest of Denver, just south of Fort Collins.

Tom had never been to Salt Lake City, so they took advantage their first evening to explore the downtown area.

Following dinner at a restaurant specializing in locally raised beef, they walked through an area with many small cafés and movie theaters.

Tom kept glancing back over his shoulder until Bud finally asked, “What gives, skipper? You keep looking back. Trying to see your own shadow?”

“No, Bud. When we left the restaurant, there were three men standing across the street. Everywhere we’ve walked since then, they’ve been behind us. I’m pretty sure we’re being followed.”

Bud stopped and turned around. He immediately spotted the trio of men in their mid-twenties. When they saw that Bud has spotted them, one of them said something to the others and they began running toward Tom and Bud.

“Look out, Tom. Here they come!”

The two faced the onrushing men. One of their attackers tried to do a flying tackle on Bud, but the young athlete simply sidestepped and the man shot past.

Tom parried an attack by one of the others who tried to grab at his light jacket. Tom swung a roundhouse punch into the side of the man's head, knocking him off balance. A kick to the stomach took all of the fight out of that one.

As he turned, Tom saw that Bud was trading punches with the third man. Although appearing to have some fighting skills, the man was unable to land many of his punches. Bud was dodging and weaving and hitting the man with about two of every three shots thrown.

Tom grabbed the first attacker and pulled him upright, holding him in a headlock from behind.

"Who are you and why are you attacking us," he demanded.

The man appeared to be choking, so Tom loosened his grip. This was a mistake and the man spun in his grasp and head-butted Tom in the face.

Tom lost his grip and the man pulled free and ran away. He was joined by his two companions in flight and they were soon around a corner.

Bud leaned over and placed his hands on his knees, breathing heavily. As he straightened up, he could see blood flowing down from Tom's nose.

"You okay, Tom?"

"Yeah," came the rueful reply. "Just a little bruised."

As Tom was trying to stop his nosebleed with his handkerchief, a police car pulled up and two officers jumped out.

"All right, you two. You're under arrest," one of them barked grabbing hold of Bud's right arm.

Tom and Bud knew not to resist arrest and allowed themselves to be handcuffed. Finally, Tom asked, "Why are we under arrest, officer? We were attacked by three men who had been following us. They're the ones you should be arresting."

"No. It's you we *are* arresting. We got a tip off that you're here in town getting ready to distribute cocaine and heroin. You ain't gonna get a chance to poison our city. Understand?"

The officer yanked upward on Tom's arms causing him pain.

Shoving the youths into the back of their car, one of the policemen laughed, "You're going to rot in jail now!"

CHAPTER 11 /

A RELUCTANT (ALMOST) FLIER

IT TOOK HOURS before Tom was allowed to make a phone call back to Enterprises. He reached the night shift security manager and told him about their plight.

Gary Bradley, one of Harlan's elite security men and number four in the hierarchy at Enterprises' Security, promised to get right onto it.

"Don't worry, Tom. We'll get to the bottom of this. I'll call Harlan at home. We should have you out of there in no time."

It was only twenty minutes later that the duty lieutenant came to their cell. He motioned a young officer to unlock the door.

"I really have to apologize to you, Mister Swift and Mister Barclay. My officers were working from a lead phoned into them just minutes before they located you."

Tom shook his head. "They wouldn't even listen to me. All they were interested in was getting us cuffed, quite tightly by the way, and arrested."

Scratching his neck, the officer continued. "As I said, it was a lead. We have to follow up on these things. Especially when the lead gives us both a spot on description of the pair of you as well as details about your criminal activities."

He wasn't too happy to hear that Tom intended to have Harlan get the FBI involved.

"We came here to just take a look around and your men unceremoniously hauled us in and tossed us into jail. All on an anonymous tip. I'd say that deserves further investigation, don't you?"

The lieutenant offered to have a patrol car return them to their hotel.

"We're staying at the airport. I believe we'll find our own way there, thanks all the same," Tom replied curtly.

The following morning they flew the *Sky Queen* over a large area scanning to see if their maps and satellite photos were adequate enough to determine the proper place to begin this end of the tunnel.

"Looks like we'll have to knock through a couple of low hills before we tunnel in, Bud," Tom said pointing down at the

proposed path of the tracks.

“Are you going to have to go under them, Tom?”

“No. I’m pretty sure that we will just need to cut a groove in them, like when a freeway goes through a low hill. We can use a TBM, running along the surface at a preset level, and coat the walls as we go along.”

Tom spotted the precise site of the tunnel entrance and took a GPS fix. He also dropped a marker on the spot. It rushed down to the ground and buried its four-foot shaft in the soil. A small explosive charge distributed bright orange dye in a five-foot circle around it. Finally, Tom switched on a receiver and checked to see if the small radio beacon was working.

Satisfied, they gained altitude and headed for the anticipated exit point, several hundred miles to the east. There, they repeated the process of marking the tunnel site.

A radio call from Enterprises cut short their plans to do a slow flyover of the rest of the route.

“Skipper,” Harlan radioed. “The FBI would like you to come to their office in Boston this afternoon. They have a sketch artist ready and want to try to figure out who it was that attacked you in Utah. Chances are, they also made that call to the authorities.”

Tom and Bud were soon winging east at high speed.

By the time they arrived in Boston, Harlan called Tom on his cell phone to tell him that the FBI had been unable to trace the tip-off call, but knew that it had come from an area outside of Salt Lake City. They also reported that the Salt Lake City police had given them information that it was a woman’s voice on the phone.

“The police are falling over themselves to be helpful, Tom. The officers that arrested you have really been grilled over their tactics. One of their units picked up one of the creeps that attacked you and Bud an hour ago. He’s—uh—cooperating with Salt Lake P.D.”

“Do I still need to meet with the FBI?” Tom asked.

“Yeah. They’ll have this guy’s photo, so give them a description of the other two if you can. See you back here tomorrow.”

The boys were met at Boston’s airport and driven to FBI headquarters. There, they gave as much information as they could to an artist who developed two fairly accurate drawings.

They thanked the agents and were returned to the airport. They arrived back in Shopton near dinnertime.

“See you tomorrow, skipper,” Bud called as he climbed into his car.

The next morning, Tom went over all of the plans and sketches of the giant machines that would create his underground tunnels and checked them against the actual behemoth standing nearby. He was quite pleased with the design and finished product of his tunnel digger.

So far, the head unit had been joined with the central area that would eventually house the pumps and conveyer system that would move all debris out to the back of the TBM for collection. The tunnel-lining unit was still to be constructed—as was the rail laying system—but Tom could already imagine how long the total machine was going to be.

He strongly believed that the best thing to do would be to start his test tunnel right at the point where the eastern terminal would eventually rise. He intended to bore down to the most efficient depth and then to create the first twenty miles of tunnel.

He contacted the DOT and was granted permission to enter the fenced-off area to begin his dig. After carefully studying the design plans for the terminal building he was able to determine the precise location to begin the dig so that it would match with the storage and transfer building’s switchyard.

Five days later he had the giant front digging head from his machine broken down and transported to the start location. While it was being reassembled and prepared for work, Tom oversaw the starter hole dig. A group of standard digging and excavation machines began the slow, sloped hole that would take the trains up and down a two-degree incline from surface level to the underground tunnel that would level out some two hundred feet below.

Once this ramp was complete, Tom ordered all other equipment taken out of the hole that was now almost eight hundred feet long and had reached a depth of about forty feet. Engaging the caterpillar treads he inched the giant machine forward and was soon entering the sloped area. When he reached the dirt wall he realized that there would be troubles.

As soon as the machine would have begun digging, the dirt above, not currently supported, would most probably crumble and collapse onto the tunnel borer. He climbed out and walked back up the slope.

“What’s up, Tom?” Bud asked. “I was just getting the splatter team ready.”

“Splatter team?” Tom asked.

“Sure. Until you connect all the different parts of the Gopher, we’re pulling a wall-lining unit behind you with a D9 Caterpillar. The foam comes out of the nozzles and sort of splatters against the walls before it gets smoothed out.”

Tom grinned and shook his head. “Can’t resist it, can you?”

“Nope. But, my question stands. What’s going on?”

Tom explained his concerns then asked Bud to organize a small group armed with their hoses and foam to come down and to coat the vertical face of the upper area above where he wanted to dig. “That should hold things up long enough for the digger to get inside its own tunnel and for you to follow and get the foam coating really going.”

“And, what if that doesn’t do it?”

Tom thought. “Well, then we have to dig the start point deeper and farther out and build a solid roof above us. It can be filled back in with dirt later to the proper depth. We might have to do that anyway just to ensure strength.”

Tom’s plan was carried out and soon the digger had begun eating away at the dirt and rock. Although the blaster technology might allow Tom to move the digger forward at a faster speed, he opted to keep the test to less than half of its top speed of twenty feet a minute. In a half hour’s time he had not quite reached the tunnel’s final depth but had forged ahead more than 300 feet. He stopped the big machine and exited out of the rear door.

Bud’s ‘splatter team’ had already completed their work up to about fifteen feet behind the digger. Tom inspected their work as the pair walked back out of the tunnel and was slightly dismayed to see that the foam appeared to have slumped as it set close to the entrance.

He had hoped for instant hardening and was puzzled by how the real world test differed from his own lab tests. Then it hit him.

“Hey, Bud,” he called his friend over. “Take a good look at a real dope.”

Bud said nothing, preferring to let Tom finish the thought.

“See how the foam has sagged and slumped a little here,” he said pointing at the ceiling above to them.

“Sure. It’s not exactly smooth, but it won’t bother the trains, will it?”

“No. What’s actually happening is that the tunnel entrance and roof is sagging under the weight of the ground above. We’re shooting the foam and the paddles are smoothing it out, but the

actual tunnel isn't the right size. In just the couple minutes from the time the TBM passes through until you 'splatter,' the dirt has shifted. It isn't holding its own weight for those extra minutes."

"Oh. I see now," Bud told him. "Can we go along and push it back up and smooth it out as we move on?"

"I don't think so, Bud. First, when the TBM started the hole and then eased into it, we didn't have anything right away to support the edges of the entry until the back end of the machine got past that point. Even though the foam has set really fast inside, we don't have enough initial support. That's why the tunnel has sagged near the entrance."

"So, what do we do?"

Tom thought. "First, I back out of the hole. Luckily, I thought to make the head unit so that it can contract a foot or so. Otherwise, we'd be only able to move forward now. I guess that we either need to rig some sort of interim foaming unit right behind the control cabin, or do something else. And, we can't add anything behind the cabin because of space constraints."

They talked about the situation a few more minutes before they were approached by one of the government engineers assigned to observe the test.

"I see that the entrance has subsided a bit. Would it be possible to cut into the rock a few feet before the TBM starts digging in and then erect an already-prepared archway? That might hold the opening at the correct size and allow you to then go in and do the proper digging and tunnel coating."

Tom reached a hand out and shook the man's hand. "I think you've just hit on our solution. My hat is off to you."

"My name is Bobby Watson. If you ever need a structural engineer and hydrologist, I'd be very pleased if you gave me a call." He handed Tom his card.

He explained that his current position with the DOT would disappear at the end of the train project and he would be looking for future employment.

Tom assured him that he would keep the man's business card and contact information.

"You can never tell, Bobby. We do all sorts of things and might just need a man like you. Thank you."

Tom made a call back to Enterprises and requested delivery of enough thin, flexible strips of Durastress to build a mold of the proposed arch on the ground. Within three hours they had been

delivered, and Tom set to bending and staking out the shape.

While waiting, he and a few others had measured and marked out the arch shape and size on the ground. Bud backed the TBM out of the tunnel and it stood nearby, ready for its second foray.

“This arch is going to have a lot of dirt stuck in it on one side,” Tom commented, “but we’ll just make sure that it becomes the inside where nobody will see it.”

A few hours later the form had been created, checked and adjusted, and the tunnel foam had been siphoned out of the TBM and poured into the mold.

In less than a minute Tom, Bud and five others had used impromptu tools to smooth it out before it completely set. Stepping back to admire the work, Tom was satisfied. He chuckled when he glanced at the apex of the right arch and saw that Bud had inscribed ‘Watson’s Arch’ in the foam.

The group dragged the new arch over and tipped it up into position. Using the D-9’s front bucket, they eased it into the tunnel entrance. A fair amount of pushing and shoving was required to get in into position and to push back the sagging earth, but it was soon in place and plumb.

Tom reentered the TBM and drove it back into the hole. Three hours later he stopped and declared the test to be a success.

“We’ll need to leave her inside for now,” he stated. “Might as well, anyway. Once we get the go-ahead, she’ll just start back up and continue digging. We can assemble the rest of the machine in place.”

The following afternoon Bud came into Tom’s lab having been paged. “What’s up, skipper?”

“What is up is about eighty percent of the test track for running the test car outfitted with our little Y-4 engine, that’s what,” Tom replied. “I need you to take over all the prep and get it completed before Friday. That’ll give you three days. Okay?”

“What needs to be done?” Bud inquired. “I haven’t been out to the test area to see how things are going.”

“Well, we’re laying a mile and three quarters of track using one of the WorkCopters. Most of it will remain on the ground, but we’ll install repelatrons to lift it at three locations to show the climbing power of the engine. I need you to make sure the last bit of track gets extruded today, and then oversee the repelatron installations tomorrow. After that, it will be a combination of fine-tuning the track and you taking a few test laps.”

“Do I get to do the demo, Tom?”

“Both of us will. You’ll take the car around the flat track three times showing the amazing speed capabilities, then we’ll be hooking up a three ton load, raising the hills, and I’ll take that for a drag around the track and up the hills.”

Bud enthusiastically oversaw the remaining preparations. The track included two long straight-a-ways, numerous turns and one three-leg loop that was designed to show how well the engine could accelerate out of sharp turns.

As he examined the demo car, Bud saw that Tom had, indeed, created a virtual snap-in engine; the engine would be run outside of the car on a test bench and then quickly lowered into the car and connected in a process that would require less than five minutes.

A gentle tap on one shoulder startled him out of his thoughts. Turning, his face split into a huge grin as he saw Sandy Swift standing there. She moved in and quickly wrapped her arms around his neck, giving the startled young man a big kiss.

“Tom told me you’d be here,” she said stepping back but grabbing Bud’s right hand in hers. “Let me introduce myself. I’m Sandra Swift, long-suffering girlfriend and infrequent date. How do you do?”

Bud blushed. “Guess I rate that, don’t I?” he stated.

Nodding, her blond ponytail bobbing behind her head, Sandy replied, “Yes, Bud. You do. I only hope that my brother is as embarrassed as you are when Bashi gets to his office.”

She outlined a planned afternoon and evening out. The two couples would take off right after the Saturday morning demonstration of the Y-4 engine and head for a beach house on the New Jersey shore. There, they would meet up with two other couples and have a wonderful afternoon at the beach, capped off with a moonlight dinner to be provided by Chow, who would also act as chaperone for the couples that night.

“We’ll meander back on Sunday. Bashi and I would like to stop in Albany at a little boutique that sells jewelry from one of my favorite designers.” She looked, knowingly, at Bud.

“Would that be the place where one young scientist and his faithful sidekick test pilot buy their ladies something nice?”

“Ah. You know the place, then,” Sandy said with a straight face, which she held for almost a full second before breaking up into giggles.

By Friday afternoon everything was complete, including the sections of the track that could be raised and lowered by repelatron to provide varying degrees of uphill and downhill grade.

The grandstand that would hold the one hundred or so invited guests—mostly car company executives and automotive writers—had been erected that morning and was being checked over by the installation crew.

Tom and Bud wandered over to watch their work. “Looking great, guys. Thanks for getting this up today,” Tom told them. “I’m going to take the car around the track for a few laps, Bud, then I suggest that you do the same. That way, we’ll be familiar with the layout.”

Tom climbed behind the wheel of the demo car, checked that everything seemed to be okay and buckled himself in using the 5-point safety harness that would ensure his welfare in the event of an accident.

Giving Bud a thumb’s up sign, he gunned the car and took off down the first straightaway. The car practically shot down the track and was soon approaching the first corner, and one hundred miles per hour. Tom downshifted, tapped the brakes and turned the wheel. The little car reacted as if mounted on rails.

After racing up and down the first inclined section, he radioed Bud. “Bring the power to the repelatron up about five percent on the next one, please.”

“Roger!”

Five laps later, Tom pulled over at the start/finish point and climbed out. Bud could see the grin on his best friend’s face and he, too, started to grin in anticipation.

“Looked like an absolute breeze from over here, Tom,” he observed.

“Right. At no time did I ever feel like the car was close to the top of its power range. I’m sure that it will be just the same when we attach the tow load. You take her out now, before we test the load capacity.”

Bud climbed in and was soon scooting off. On his second lap he radioed, “Hey, skipper? What gives with that first hill? I lost traction at the top and think I caught a little air. Is that right?”

Tom looked at his instruments and the telemetry feed coming from the car. “That shouldn’t have happened. The board says everything is okay. Try it again and I’ll keep a close watch on it.”

Bud gunned the engine and came back around for another run at the first hill.

With Tom keeping an eye on the instruments, he floored the accelerator and headed up the incline.

Almost immediately, Tom noticed something was going horribly wrong. The indicator for the repelatrons showed that they had switched into full power mode. A fast glance at the track verified it. The track's hill was rising.

Bud, with little to give an indication of the increasing elevation, shot ahead.

With a startled cry, Tom could see that his friend was about to crest the hill and, at his current speed, would be catapulted into the air.

"Bud's going to crash!"

CHAPTER 12 /

COLLAPSE

HIS FINGERS raced across the control board. Tom knew he had just seconds to avert a disaster. Shutting the repelatrions off wasn't going to work. The entire track would crash to the ground.

He began to systematically reduce their power taking only a split second to stab a finger into the radio transmit button.

“Bud! Brake hard. Now!” he shouted.

Any other person might have hesitated, but Bud Barclay was an experienced test pilot and knew that questioning an order might mean death or disaster. Without thinking, he pulled his foot from the accelerator and jammed in onto the brake pedal. The car began to shudder and the wheels were screeching, but it was slowing down. He reached out and pulled the gear lever down from 4th into 2nd gear and popped the clutch.

The effect was immediate. The car had gone from over ninety to under twenty in less than two seconds. Only the safety harness had kept his body from being flung forward by the inertia.

At the control panel, Tom was completing the process of lowering the track to its grounded position. As soon as it touched down, he turned off the panel and jumped on the electric scooter he had parked behind him.

In less than a minute he was by Bud's side, the driver having already climbed out of the car.

“Good brakes, skipper. Not too much smoke.”

“Are you okay?” Tom asked slightly out of breath even though he had not run to Bud's location.

“Sure. All in a day's work. So, what went wrong? Did I give her too much oomph?”

“No. Something went haywire in the repelatrions for this section. It was heading up too much and all on its own.” He explained how Bud might have become airborne with a pretty nasty landing.

They both looked at the span of track that had almost become Bud's final test drive. “Not in too bad a shape, is it?” Bud inquired.

Looking it over, Tom replied, “No. This section looks good. I was able to get her down safely, along with you. It's the other

inclines that I've really got to check." He motioned to the second portion of track, an area that had crashed down when Tom turned off the control panel without properly lowering it.

Bud whistled. "Kinda twisted over by that bottom turn, isn't it?"

Tom agreed. They began walking the quarter mile or so to inspect the damage. As they walked, Tom TeleVoc'd to the crew chief involved in the laying of the track. "Andy? Can you get the WC back out and bring her to the test track? We've had a little accident and I broke some of the track. I'll explain when you get here, but we need to get this replaced in the next hour or so. Thanks!"

The repairs took less than half an hour. Fortunately, as Tom explained to Bud, the track was still slightly flexible so the damage was limited.

The next morning, before any of the guests arrived, Tom did a complete system check. He discovered that a poorly soldered wire in the control panel had led to an intermittent short in the repelatron settings. He let out a rueful laugh. "*I almost outsmarted myself into injuring Bud,*" he thought. "*It made sense to have the repelatrons maintain power in case of a loss of control signal. I just never considered that each short and restoration of power would set the repelatrons one notch higher. And higher. Hmmmph!*"

He pulled out his portable computer and signed into the secure Enterprises system, then into his software design application suite. In minutes he had fixed the problem, setting the controls to only recognize a single power loss or fluctuation before automatically lowering the track to the ground.

As the first of the guest began arriving, Tom and Bud discussed the demo steps. "We never had the opportunity to test the thing with the heavy load, but I think that if we keep it under fifty—after all, it is a trailer we will be hauling—that everything should be okay," he told Bud.

"How about stopping half way up one hill to show how easy it is to get going again?" his dark haired friend suggested.

Tom slapped him on the back. "Great idea, Bud!"

Tom kicked off things with a fifteen-minute talk and show-and-tell about the engine and some of the applications it might have. He could see looks of disbelief on many faces as he finally uncovered the actual engine. There were a few people who began laughing. One man, a writer for one of the Internet-based publications got up and began to leave.

“I’m certain that if the gentleman who is heading out remains here, even he will be convinced that this is a serious invention. Won’t you please stay, sir?”

The man, somewhat bothered that Tom had pointed his departure out to the crowd, scowled and shook his head. “Don’t like being lied to, sonny! You may think it is some big joke getting us out here on the weekend to see your little joke, but I’ve got better things to do!” With that, he walked away.

One of Harlan Ames’ security men accompanied him to the gate.

“Well, I hope that you folks will give us the benefit of the doubt.” There were murmurs and head nods and head shakes all through the audience, but nobody else got up to leave. Finally, a woman Tom believed was the representative for one of the Korean auto manufacturers said, “I see no reason to doubt you, Mister Swift. I only hope that you can prove your point, and quickly, please.”

Tom nodded. He walked over to the test bench, attached a two-quart plastic fuel tank, and started the small engine. “We will run the entire set of tests using just a half gallon of gas,” he told them.

He invited the crowd to walk past and examine the running engine in case anyone believed that it might be just sound effects they were hearing. They also walked around the car; its hood, doors and trunk opened so they could all see that there was no existing engine in the car, not even one hidden under the seats.

Twenty minutes later, he stopped the engine and within view of everyone supervised the installation into the car. He immediately hopped in and drove off.

The demonstration went off without a hitch. Every one of the visitors was in awe of its power and capabilities by the time they departed two hours later.

Tom, Bud and the girls departed in a Whirling Duck shortly after the last guest left. The afternoon and evening were fun with Chow’s dinner a huge hit. He was an even bigger hit when he pulled out his guitar and serenaded the eight members of his audience with a mixture of cowboy songs, jazz hits and a few modern tunes.

Bud walked up to him with an extended hand. “Great music, Chow. I have to hand it to you; I never would have thought you’d know some of those recent hits.”

They all turned in around midnight. At seven, Tom was awakened by the aromas of bacon, banana bread and hot coffee.

Chow, always an early riser, had been up for more than an hour preparing their breakfast.

Following breakfast the younger folks took a dip in the ocean while Chow packed up his kitchen gear. He flew back to Enterprises with Tom, Bud and the girls while the other two couples drove back in the large sedan they had come in.

Tom was pleased to note that the one early-departing writer didn't put anything into his company's website that entire next week. He was not at all surprised when the man called the following Friday to apologize and to ask for a quick viewing.

"Well, sir. We've already dismantled the test track and the car and engine are undergoing some exhaustive testing right now. How about I send over a DVD with the presentation and the demo?"

With nothing more to do, the man reluctantly agreed.

Several days later Tom was informed that the first Gopher destined for the Sierra Nevada mountains was about to be packed up and shipped out to California.

"Let's get it into place, and I'll fly out to take her in the first mile or so," Tom requested. He asked about the remaining components for the TBM already in the hole at Binghamton.

"On their way tomorrow, skipper," he was told.

By that Monday the tunnel lining parts for the digging head used in the first test bore had been picked up by the *Super Queen* and delivered. The giant jet then returned to Shopton where the Enterprises team had packed the second digger head and lining unit into a pair of specially made modules that were hoisted aboard the *Super Queen*. The five-hour flight was uneventful and the assembly team got to work that evening putting the behemoth together.

Tom arrived the next afternoon and was amazed at the sight that awaited him. The team had decked out the monster with colorful ribbons and helium-filled balloons; the balloons were so small in comparison to the TBM that they looked like little bubbles.

Sitting in a cradle on the back of the TBM was the prototype of the vertical diggers. These fifteen-foot wide circular machines featured a single wide-focus earth blaster that would sweep around and around on a built-in track, eating away at the rock and soil it traveled through, just like the TBM. Unlike its huge brother, these machines only went up and down, moving by means of a set of five caterpillar-style tracks arranged at 72-

degree angles from one another. These could drive the devices up or lower then back down at a speed of better than one hundred feet per hour. All of the debris and gaseous remains would drop back down the shaft, there to be collected by special container trucks and taken out of the tunnels.

Once a shaft was complete, a second version of the device would go back up spraying a coating of the same material that coated the main tunnel bores.

Bud had nicknamed them ‘Shrews’ and ‘Spews’ defined by whether they dug or sprayed.

“It’s better that Shrews and Skunks,” Bud remarked when Mr. Swift had questioned the nicknames.

For this test run, only a single Shrew would be used. When they reached the one-mile point of tunneling, Tom planned to raise the shrew and create the first shaft. For this test, it would be manually raised using a scissor lift. Later, once the ‘launching’ device had been completed, Shrews and Spews would be mounted in a bay behind the control cabin.

The TBM moved forward and into the small indentation that had been dug into the first hill. An archway had already been erected and would keep the opening at the proper dimensions. This would provide the proper starting point for the tunnel that would eventually span more than one hundred ten miles.

Giant ventilation and evacuation hoses trailing behind—one to provide fresh air and the other to suck out the gasses created by the earth blasters—the Gopher began inching ahead. Within ten minutes it had fully disappeared into the hole.

Tom needed to stop the machine several times to make adjustments to the coating nozzle and smoothing system before he had reached the half-mile point. After that, he pressed ahead at better than a quarter mile per hour. He only stopped when he arrived at a point four miles in from the entry of the tunnel.

With the TBM stopped, Tom radioed that he was preparing to launch the Shrew on its maiden voyage.

“I have a good GPS lock on my position. Can you see me on the electronic chart?”

“Roger, skipper,” the technician sent back. “I show that you have exactly one hundred eight feet of dirt above you at the rear of the TBM and one hundred twelve at the front. Do you concur?”

Tom did. That meant the Shrew would come out on a hillside, but it was designed to handle an even steeper grade if necessary. He pressed the start button and the computer took over control of

the Shrew.

“I’ve deployed the Shrew’s evacuation hose. You should have something coming out in about five minutes. I’m pressing ahead. I won’t bring this one back down. Send the recovery team in to pick it up in a half hour or so, okay?”

“You got it!”

Tom moved back to the main control seat and started the TBM forward. Five minutes later, the rear of the machine passed under and beyond the first vertical shaft. He had paused the Shrew a few feet into the hole so that only a small amount of debris would fall onto the Gopher. Once past, he let the shaft digger move upward.

An hour later, as the vertical shaft was nearing ground level, the Gopher was rocked and shaken by an apparent explosion. Tom stopped immediately and went to the rear door to look back down the tunnel. The lights of the Gopher could not penetrate the darkness. Returning to the control seat he was about to pick up the radio handset when a faint call came through.

“Tom! Tom! Are you okay? Please answer!”

Keying the transmitter he replied, “Yes. I’m here and I’m alright. What’s going on?”

“There was an explosion in the vertical shaft, skipper. Something blew the Shrew apart and sent all sorts of rock and dirt back down into the tunnel. It’s about sixty percent blocked. Gonna take us a couple hours to dig it out and haul it back to the entrance. Are you sure you’re okay?”

Tom confirmed that he was. “I might as well continue forward another hour or two. Just let me know when I can hike out.”

“Will do.”

By the time Tom returned to the site of the explosion, all that could be seen was the last foot or so of dirt and rock spread out on the tunnel floor. The wrecked Shrew lay to one side, a mass of twisted metal and shattered gears.

CHAPTER 13 /

POWER PROBLEMS

“IT WAS SABOTAGE, Tom,” Harlan Ames pronounced, walking into Tom’s office the next Tuesday.

“*Sabotage?* How can you be sure?” the inventor asked.

“Three things. First, there is explosive residue all through the dirt samples we brought back. It’s TVAREX 4A! Same stuff used to sabotage your test train. Second, the kind of destruction done to the digger is absolutely the result of some explosive force—an *external* explosive force. The third one is the worst.”

“How so?”

“We put a team on the ground around where the hole was supposed to come out. Someone had mined the area, Tom. I’ve got two of my best men that had to be air lifted to San Francisco. They tripped another mine and—” He paused, trying to figure out how to word the news.

“One, Alan Corman, has severe second degree burns over sixty percent of his body and the other, Pete Serango, lost one of his legs just below the knee.” Seeing Tom’s stricken face he added, “He’ll survive. We’ll get him outfitted with the best prosthetic available, and he’ll be okay. Mostly...”

Tom was in shock. He wanted to pound his fist on the desk and shout, but he could only manage a slow, sad shake of his head.

“I’m sending in an air recon unit to follow the entire path of the tunnel. If there is any more TVAREX, or any other explosive, out there, we’ll find it. I promise you this won’t happen again, Tom.”

Tom looked into Harlan’s eyes. “Please make sure they have the very best, Harlan. Okay?”

Ames nodded. “Sure, Tom. Absolutely! Just one other thing. We were able to pull a partial fingerprint from a piece of the test train’s battery car. It’s a match for prints we found on that cutter device that almost crashed you and Bud in the SE-11. We’ve got a pretty nasty person out there. He’s unknown to the FBI’s database. We’re working with Interpol in case he’s in their system.” He left the young inventor with his thoughts.

It took several days for Tom to feel emotionally up to continuing with his work. It was only when Harlan came to tell him that both of the Enterprises men had been released from the

hospital in California and were on their way back to Shopton that he finally took a deep breath and headed to his lab.

Without being able to analyze the recorded results from the Shrew—he had never considered that the data recorder might need to be protected—Tom had only guesswork and a few measurements to go on in completing the final designs.

The speed had been right and the amount of debris coming back down the shaft debris was right within the levels he had anticipated. Still, he considered a radical change to the digging version of the device. Perhaps, he pondered, if we had some accurate measurement of the amount and weight of the non-vaporized materials I could develop some sort of holding container at the back that could be emptied once the digger got to the surface.

When he mentioned it to Bashali that evening, he barely got the first part out when it struck him. He suddenly stopped. She asked him, “Is everything okay, Thomas?”

“Yes and no. As I started to tell you, I was thinking about collecting all of the rock and bits in a glorified bucket at the back of the Shrew and then figure a way to empty it at the top of the hole, only I just remembered that the first hole we dug was about the shallowest one we will ever have.”

“And, that means—” she ventured.

“That means that there is no way a Shrew can haul the sort of heavy loads up the shaft we will encounter farther along. Guess it’s going to have to be shovels and dustpans.” He smiled at her.

“Now, Thomas, I know that you are a man and possibly you have never heard of such a thing, but women have known, for years I must add, about this thing called a vacuum. With a big bag that collects the dust and dirt, and a filter to capture the small dust particles.”

Tom looked at her in amazement. That’s it, Bash! You’ve solved another one. I just need to create some sort of self-adhering collection bag or hard container to each shaft and collect everything, then seal it and take it out.”

“Would you place the container on a truck?” she asked.

Tom considered the problem for several minutes before answering. “You know? I think we may have solved two problems. I’m going to make the containers just small enough to fit back up in the vent shafts. We can haul debris from the Shrews and anything from the TBMs up to the surface using a winch and dump it or haul it away before we top the shafts with grating. Ah,

Bash. You are my inspiration!”

Bashalli felt a warm sensation embrace her. She realized that she had added something very important and that Tom was pleased. She smiled at him and took his hand.

“Any time you want to discuss anything you are working on, I want to be there for you. Perhaps, such as tonight, I can offer some inspiration.”

Tom, buoyed by the ideas given him by Bashalli, was considerably more animated the rest of the evening.

The next morning he sketched out a slightly modified case for the Shrews and a collection container that would be raised and attached to the bottom of the hole just before the device was “launched” upward.

His next task, and one that he now realized should have been part of the original TBM development, was to design the track extrusion machine. His design was fairly simple consisting of a treaded vehicle—that eventually would be mated with the back of each TBM—that contained its own tank of chemicals that would be partially hardened before being extruded in the form of both rails plus the solid vertical pieces that would be attached to the floor of each tunnel.

Inside of the machine would be a reel with the special hollow NiChrome wire filled with Serpentium gas that would be used by the corresponding gas-filled wheels of the trains to help create the necessary lift. Tom had concluded that the extra lift would only be necessary in the tunnels where the non-metal rails could not act as heat sinks to dissipate the build-up of heat in the wheels. Once out of a tunnel, the lift of just the wheels would be sufficient.

A cam-operated mold would create and adhere cross bracing every few feet along the tunnel.

He looked at the design and then made a decision. He put in a call to the manager of the California bore and told him to stop digging.

“Unless we make this all part of the lining system, it will never be strong enough. I’m certain that we can get an enhancement out there in three weeks. In the meantime, it would be useless to continue.” He placed the same call to the Binghamton site.

He then called all of the department heads that would need to be brought up to speed on this latest change. Once presented to them it was obvious that Tom had spotted a major flaw that must be addressed. They all promised to get on the work immediately.

Tom held a roll call of each person asking for an estimate on

their part of the job.

“Eight days.”

“Five days, Tom”

“A solid week, skipper.” “Eleven days with overtime.”

And so it went. In the end, Tom was certain that an enhanced lining and track extrusion unit could be built in just shy of three weeks and delivered right after that.

When he told his father that evening, Damon Swift suggested, “Why don’t you add the brackets to the molded bracing that can be used to attach all of the cabling and ducting? It would sure make finishing each tunnel faster and a cleaner process, don’t you think?”

“I sure do, Dad. Thanks!”

A single call the next morning was all that was needed to get that idea into play.

Soon after that, Tom was sitting in his lab when the intercom buzzed.

“Tom? It’s Trent. Your father needs you in the office right away. There is an important call from the Department of Transportation and he wants you involved.”

Tom promised to be there within minutes. He then jumped up and ran out of the lab. By the time he arrived at the office, Damon was just explaining the latest developments regarding the sabotage.

“So, while we have two seriously injured men, they will recover. I’m happy to hear that you are getting the FBI onto this. Perhaps they can lean a bit harder on possible suspects. Ah, here’s Tom. Go ahead with what you started to tell me, sir.”

“Hello, Tom. I think I’ve already hinted to you that we might be needing additional assistance. As we feared, CanPacLant has been closed down by the Canadian government. Even though we let them know that their involvement was vital to our project, the simple truth is that CanPacLant owes more than a billion dollars—half in taxes—has been promising payments for more than two years to its debtors, and had already had most of their leased equipment taken back even before they responded to our RFP.”

“I hope you didn’t front them too much money. Can I assume that you want us to take on the entire freight car production job as well?”

“Can you?” the DOT Secretary asked in a voice that told of both

his hope and his fear regarding Tom's answer.

"May we place you on hold for about half a minute, sir?" Tom requested.

"Certainly."

After pressing the Hold button Damon asked Tom, "Is this possible?"

Tom grinned and told his father about the scale mold and 4-part freight box assembly. Damon grinned back at him. "So the answer is yes, right?"

Tom nodded and Damon reconnected the call.

"It appears, Mr. Secretary, that Swift Enterprises and the Swift Construction Company should be able to ramp up and take on that part of the production work. As it is already our design, we are confident that we can deliver at the very least half the total number of cars on the due date and the remainder within three to four months."

"Well, of course I am glad to hear this, but I was hoping that you whiz kids up there in Shopton might be able to do the full run. But, we will take what we can get. I'll have the contracts to you day after tomorrow."

Tom added, "And, we'll see how many additional cars we can squeeze out by the due date, sir. No promises, but we will make it a priority."

"The other thing I hope you can take on is laying tracks on the one section the Canadians were given to do. It's from your tunnel in Colorado out about a hundred miles. Mid-West Construction can do the roadbed prep, but they can't commit to putting down the actual rails. What do you think?"

Tom told the Secretary that it was technically possible to build a track-only extrusion machine, "But it will be beyond the cost of the actual rails, sir. I'll forward a cost detail to you by this time next Monday."

When the call was over, Damon asked, "Are you sure we can deliver? After all, with eight trains and each one hauling a hundred cars, that's eight hundred. Even with your snap-together manufacturing, how many can we make in a week?"

"I've been talking to Jake and he believes that we can put together the assembly lines in less than a week. The molds can make the four pieces in under an hour and the assembly work should take less than forty minutes. Once the first pieces are out of the molds, everything overlaps."

“So, up to eight a day?”

“Right, and that means that in the thirty-eight weeks remaining, we could conceivably be able to build more than fifteen hundred. We should have plenty of time.”

Damon Swift was constantly amazed at his son. Tom had really taken control of the situation, and the father felt great pride in the son.

“I’ll call Jake and tell him to ramp up,” he told Tom.

Tom looked thoughtful for a minute, then he asked his father, “Should we hold back a little on the deliveries? I mean, now that we have told the Secretary that we probably can’t deliver all of the cars on time—”

“Which he needed to hear, given that we are being brought into that part of the project almost four months late,” Damon reminded him.

“Okay. But my idea was that if we go ahead and make the full delivery, will Washington just assume on the next project that we can pull a miracle out when they should have given Enterprises the contract in the first place?”

Damon Swift thought this over. It had always been the unspoken policy at Enterprises and the Construction Company to promise slightly less and deliver considerably more. It had proved to be a great business tactic in the past, but he could see Tom’s point.

“I’d say that we hit a happy medium. Let’s do a production run for the first, oh, say, six hundred cars. They we’ll set that line aside until a month before final delivery. Whatever we can make after that, we can either deliver or hold a few weeks.”

Tom said, “If I follow your reasoning, that way we can look like we really drove hard on the production but still send the message. Right?”

“Yes. We may change our minds between now and then, but let’s go this way for now.”

Tom left for a quick trip over to Binghamton, site of the eastern terminal and the first test bore. Before leaving he called Bud.

“Want to take a quick trip with me?” he asked, explaining that he needed to take the instrument package used to check flex, sag and stress on his first test tunnel. “I want some final measurements before we move ahead.”

“You can’t see me right now, Tom, but I am jumping for joy. Of

course I'll go with you. Give me ten minutes and I'll meet you at the airfield. What are we taking?"

"Thought we'd grab a *Racing Pigeon* and make this a speed run."

At the appointed time, Bud arrived on a small scooter. He was attired in an old fashioned leather flying helmet and long scarf. His right hand held a pair of flying goggles.

"Spiffy Buffington reporting for flying duty, Sah!" he exclaimed, snapping into a British salute. "Awaiting your orders... Sah!"

Tom looked at his friend and, keeping a straight face, replied, "You have a button that needs polishing, Buffington. See to it!"

The friends broke up into giggles. Bud pulled off the helmet and tossed it along with the scarf and goggles into the storage bin behind the seats in their plane.

"Found those in a box of stuff my grandfather left me. I've always wanted to use them but forgot about them until last night. Let me know and you can borrow them."

The airport at Binghamton was just a half-mile from the site of the freight terminal. Tom and Bud were surprised to see how much progress had been made in the construction of the two hundred and fifty thousand square foot facility in just the past few weeks.

The trains would pull right into the center of the building, ten cars at a time, to be off-loaded, sorted and moved around the facility to waiting trucks, as many as eighty of them backed up into loading docks at any one time.

As each car was unloaded through the left-hand doors, new cargo, destined for the West coast terminal, would be loaded into the car through the right side. Tom had heard that the estimated turn time for each set of cars would be less than ten minutes.

When he mentioned this to Bud, the dark-haired flyer whistled. "Jetz! That's lightning fast."

Once his measurements had been collected—and much to Tom's satisfaction—the pair walked back to the airport and flew back to Shopton.

Before heading their separate ways, Tom asked Bud, "Do you want to sit in on the meeting with the locomotive engineers tomorrow? We're going to discuss the power system and controls. Fun stuff."

Bud looked unconvinced. "Perhaps it would be best if Spiffy

Buffington were to keep to the things he knows about and leaves the whizz-bang gizmo stuff to you and the rest of the electro-geeks.”

Most of the hour long meeting was taken up with facts and figures: how much weight to move; what inertia to overcome; dynamic pressures; and the like. Finally, Tom tried to sum everything up.

“The best thing we can offer,” Tom told the assembled team, “is our clean and safe atomic power capsules. Two in each locomotive—one for normal running and the other as a backup—will provide more than enough electrical power to run all of the motors. The new self-gearing electric motors you guys came up with will be perfect; one per each drive wheel.”

A young engineer raised a hand.

“Yes? A question?” Tom asked noticing the hand.

“Mr. Swift. I’m pretty new here. My apprenticeship just started a month ago. I’m not totally sure I understand the concept of the power device you mentioned. If everyone else does, I’ll hold my question until the end of the meeting,” he offered.

“Nope. Perfectly okay to ask,” Tom told him. He explained briefly how the self-contained pods used a tightly controlled nuclear decomposition to flow through a series of reactive plates that in turn generated electricity rather than heat. That electricity was modulated by circuitry within the unbreakable case and could be tapped into via a single, external hookup.

He concluded his description with, “These things are indestructible. We tested one by dropping it from 20,000 feet onto rocks. Only suffered a small scratch on the Durastress case.”

Later, he dropped by the Construction Company to see the first nearly complete test version of the tunnel boring machine. He laughed when he saw that someone had affixed a plaque on the side of the driver’s cabin proclaiming it to be ‘GOPHER ONE’.

It was an amazing sight. A total length of about one hundred feet of control cabin, processing facility, hydraulic launching mechanism for the vertical diggers, and the tunnel coating and finishing equipment, all sitting behind the amazing digging head. At the back were the rail extruders, one for each of the massive tunnels.

He had made several revisions to the design, making it easier for the earth blasters to do their work, but it was primarily what he had first shown Bud all those weeks ago.

The construction team was just preparing to install the huge

tank that would hold enough of the coating foam and hardeners to cover a mile of the tunnel.

Tom also stopped to admire the launching station that would press each vertical boring unit up into the ceiling just ahead of the foam and finishing stations. It would take each of the five VBMs carried on board about ten seconds to create a hole wide and tall enough to allow their caterpillar treads to gain purchase and to power them upward.

Although it was planned that the VBMs—the Shrews— would simply reach the surface and reverse back down the hole, for the longer shafts they would be recovered by technicians topside who would recharge their batteries and then reverse them back down the shafts where they would be safely recovered down in the tunnel and replaced onto the staging cradle of the TBM.

It had finally been decided that their counterparts, the Spews, would be launched by a separate device that could not only trail behind the TBM, it could also deliver the returning Shrews to the TBM for use further down the tunnel.

Once all of the debris had been hauled out, the surface team would install a Durastress ring and mesh cover along with a baffle inside the hole to capture anything that nature—or malicious people—might toss in. It would also provide a safety cover to keep animals from falling into the holes. Although the shafts were centered above the ten-foot section between the tunnels, it was thought to build in as much protection as possible.

In case of damage, a video system would transmit pictures to a central station that could dispatch workers to fix anything necessary.

Tom was rightfully proud of his invention. Each Gopher would require a pair of ‘drivers’ who would keep the machine on perfect track. Behind them and working in the newly-created tunnel would be a team of six or seven people performing the various tasks associated with resupplying the TBM and recovering/restoring the VBMs.

GOPHER ONE would be completed within the following 4 days. It was Tom’s intention to transport it to the opposite end of the Binghamton tunnel site and to use it bore back toward the east.

The TBM already in the hole in Binghamton would be designated

GOPHER TWO once it had been completed.

On his return to Enterprises he went straight to his shared

office. There, Munford Trent handed him an envelope.

“It came in this morning’s overnight delivery, Tom. The outer envelope was marked ‘Extremely Urgent.’”

Tom opened the envelope and headed into the office. The letter was an official notice from the DOT. After the initial recap of the project it ended with:

The company selected to provide the locomotive power units (referred to as “Engines” in original RFP)—Swift Enterprises—must be made aware of a condition not spelled out in the initial RFP.

To wit: There is a high level of concern within the states that shall be traversed by this new rail system. In many cases, emergency legislation is being proposed and/or passed to limit or preclude specific types of propulsion energies. In no case shall it be acceptable under this contract that nuclear power *of any sort* be used.

CHAPTER 14 /

LABOR RELATIONS

TOM WAS still sitting at his desk looking at the letter in disbelief when Damon Swift walked in an hour later. Without a word, Tom rose and handed him the letter.

Damon looked the letter over and sat down behind his desk. He reached out and picked up his phone. Then he hung it back up. Turning to Tom, he asked, “Does this completely kill our ability to deliver the engines?”

Tom looked his father in the eye. “It means that the entire train will have to either need traditional, heavy diesel engines, run on electrified tracks—and that can’t be accomplished in the time required—or it needs to run with an overhead electrical grid. As many trains as will run per day would mean that tunnels under The Rockies would contain poisonous levels of carbon dioxide and monoxide within days if we switched back to diesel-electric.”

“Or, we have to install huge fans in each vent shaft,” his father commented.

“I guess that’s one solution,” Tom muttered.

Nodding his head silently, Mr. Swift again picked up the phone. He requested Trent to call the DOT.

When he was finally connected to the Secretary he outlined the known issues. “Mr. Secretary. I’m afraid that this imposes too great a restriction on Swift Enterprises. With regrets, I will be pulling our proposal and bid for delivery of the engines.”

There was a stunned silence at the other end. Heaving a great sigh, the Secretary said, “Then, this project is officially dead. Without Swift Enterprises taking on the lion’s share of the track and tunnel work and then the whole locomotive and freight car load, we can’t continue. Is there anything that can be done to salvage this?”

Damon put the call on speakerphone. “I’m bringing Tom into this, sir. Tom, the question is what might be done to keep the project alive if Enterprises halts work on the engines?”

“Well, Mr. Secretary, it is unfortunate that this new restriction comes in more than halfway through the project. Millions of people in this country live or work near locations that use our atomic power capsules to make the electricity they require to do

business. Isn't there any way to get the states to see how safe these have proven to be?"

"I'm sorry, Tom. It's one of those things that is out of my hands. In the U.S., individual states have the right to enact laws precluding nuclear power. It would take both an act of Congress—and they won't rock the boat with their voters—plus a national vote of the public at large to take away that power. Is there no backup available?"

"May we place you on hold, sir? I need to discuss a few things with my father."

The Secretary agreed.

"Batteries are out, I presume," Damon stated. "I believe you did the calculations and the entire first five cars would need to be giant storage batteries, right?"

"More like five for each engine, Dad."

"Diesel is obviously out. How about turbine power?"

"Unless we devote an entire car to jet fuel, maybe even two of them, the trains wouldn't be able to make the entire journey without refueling. We couldn't run them fast enough to make up for the lost time."

They stared at one another until Tom added, "And, I did originally investigate to see if I could build some sort of high-speed refueling track along the roof of the tunnels. Just too many things to go wrong including the possibility of fire—"

A thought struck Tom. He mentioned it to his father. "Possible. Let's see what the Secretary thinks."

They engaged the line. "Oh, I was just getting interested in your music on hold; a pan pipes version of 'Hound Dog.' Have you come to any conclusion? One that won't give me a heart attack?"

"While we still believe that taking nuclear power off the table will mean that Enterprises will not be able to continue with the project, we have one alternative in mind. We have an internal combustion solution that might be scalable enough to work. It will, however, require a doubling in the number of the vertical shafts within the tunnels. And that will mean cost additions."

They wouldn't allow the DOT man to pin them down to exact costs. "Let us run a few tests and do some number crunching and we'll get back to you on Monday. That's four days from now. Is that okay?"

"Better than having you drop out right now. At least, this gives me the weekend to draft my resignation letter for the President."

With that, he was gone.

Tom spent the next two days deep in research and development in his lab. Chow supplied his meals and Bud dropped by periodically to provide a little break, but he spent his Saturday night sleeping at his desk.

By Sunday, the inventor believed he could offer an alternative suggestion and one that might even be slightly better than the original proposal. When he went home that evening he discussed it all with his father.

“Why not direct drive, then?” Damon asked when Tom told him about his solution.

“I believe that the torque shock would be so great that it would seriously affect longevity of the power plant.”

They agreed to call the DOT the following morning with the proposal.

Jonas Markham had spent the most miserable weekend of his life waiting for their call. Once he had been informed that they were on his line he answered with more than a hint of desperation in his voice.

“Have you got something for me?”

Tom answered, “We believe that we do, sir. We have a new power solution in mind that uses standard gasoline along with a special high-torque, low-emission internal combustion engine that would turn a traditional generator. That pairing would replace our much smaller atomic capsules, but should still fit into the existing design of the engines.”

“You can’t imagine my relief right now, Tom. What will it do to the schedule and the cost?”

“Time wise for the engines, no impact. The cost will be almost equal as well. So long as the government guarantees to pay for the full order of eight trains—that’s sixteen engines—then we will absorb any cost difference.”

The Secretary agreed to ensure such a guarantee.

“As we mentioned last week, this will increase the need for exhaust and pressure-balancing shafts from one every twenty miles to one every ten. To make the schedule, it will be necessary to build another five of our vertical boring units at a cost of \$183,000 each.”

Again, the promise of a guarantee of payment was offered from Washington.

Damon spoke up. "Then, it agreed, sir. We will continue with our portions of the project and Washington will guarantee payments. One other thing," he felt he must add, "is that any further changes in the project that mean additional or even lost work and we pull out with a full *mea culpa* statement from *your* department. Deal?"

"Deal!"

After hanging up, he turned to Tom. "Are you positive you can do this?"

Tom smiled. "If not, I lost three nights of sleep and a few weeks off my life over nothing. I'll do it!"

He went immediately to the Propulsion Engineering group's building and asked to have the same team that had helped him develop the tiny Y-4 engine assembled in a conference room. Ten minutes later he stood in front of a team of nine men and women.

"I've got a new, old project for you folks. I know that most of you are involved in other things right now, but I need you to spend at least a day this week on a new design, and then arrange to have your other projects picked up or delayed until we get this new thing finished."

There were murmurs from around the room, but Tom continued.

"You all worked hard to perfect the Y-4 engine. I believe that we are going to have some success with that after our big demonstration. By the way, you're all going to need to work closely with the marketing team helping them understand what it can and can't do."

"Hate to push you, skipper, but what's this new thing about?"

"Glad you asked, Gil." He outlined the locomotive project and the sudden need for a high-powered, low-fuel consumption engine for the generators. "That's why I want to look into doubling the Y-4 and coming out with a Y-8 engine; something in the three to three-point-five liter range and with enough torque to spin a fifteen-hundred pound dynamo that will generate the power for the locos."

He allowed the team a few minutes to mutter and compare notes and ideas before asking for their attention.

"It can even be as large as 4 liters. The only constraint is that it must be able to be run for up to sixteen hours on no more than one hundred gallons of gas. No refueling possible," he informed them.

The team broke up with promises to get everything in order with other project before the end of the week. As they walked out, Gil Weston came up to Tom.

“I was the lead on the Y-4, Tom. I’d appreciate it if I could take this one on as well.”

Tom clapped the man on the shoulder. “I never had anyone else in mind, Gil. You know more about the thing than even I do. I’m happy that you want to be involved.”

That evening, Tom took Bashalli on an evening sail on Lake Carlopa, followed by a quiet dinner at the Yacht Club.

“Tom. In spite of a few dangers, you have been incredibly easy-going about this project,” she had told him. “I hope everything is going as nicely as you seem to portray.”

“It is, Bash. A lot of what has happened up till now has been pure engineering. You know... design something, build a prototype, test it and make necessary revisions. What’s really going to be a bear is when things come together in a couple weeks and we have to start the real digging.”

“What then?” she asked, taking his hand in hers and giving it a little squeeze.

“Then, we see if the real world comes anywhere close to our test world.” He returned the squeeze and looked directly into her eyes. “Once we get going full speed in the holes in the ground, we’ll see if our TBMs can cut the mustard—much less the rock, sand, gravel and mud—over extended periods of time.”

Following dinner, Bash suggested that they take a walk around the near side of the lake. “I really don’t want to head home just yet,” she told Tom.

Hand-in-hand, they spent the next two hours walking and talking. At one point, Bashalli stopped and swung Tom around to face her. She hugged him and then gave him a soft, warm kiss. She placed her face against his chest and stayed there for several minutes.

“I wish there were something I could do for you. Something to help this project succeed. I really like this more relaxed Tom Swift.” She gently pulled away and retook his hand, leading him back toward the Club and their car.

After thinking a moment, Tom told her, “You remember what a great help you were when we were finalizing the SkyLiner?” He referred to the end of that project when it became necessary to perform almost six days of work in just 24 hours. Bashalli had been instrumental in assisting Tom perform all the necessary

systems checks that were vital to the successful first demo flight of that amazing new aircraft.

He knew that without her by his side, the task would not only have been insurmountable, but he would have found it difficult to even attempt.

“I do not think that I did all that much,” she told him.

“Bash. You will never appreciate how much you did... both for the SkyLiner and for me.”

She moved in closer and rested her head against his shoulder as they continued their walk. Reaching the car, she gave Tom another warm kiss before climbing into the passenger seat.

“You can help me once we get to the control and power systems checks. You have a good eye for little details and a great method for cataloging and checking all the different functions.”

After dropping Bashalli off at her folks’ house, Tom headed for home and a good night’s rest.

Arriving at Enterprises the following morning he approached Munford Trent’s desk. The secretary was on the phone but indicated for Tom to wait. Placing the call on hold, he said to Tom, “I have the head of Dumbarton Construction on line two. He asked for your father, but I told him that you were the one heading the train project.”

Tom thanked the man and entered the office. Picking up the phone, he said, “Hello?”

“Is this Tom Swift?” a gruff voice demanded.

“Speaking. To whom am I speaking, please?”

Tom heard the man on the phone clearing his throat. “This is Ben Dumbarton. The owner of Dumbarton Construction. I’ll assume that you’ve heard of me given that you have poisoned my company’s relations with the U.S. Government!”

“What is it that you want, sir?” Tom asked, hoping to avoid any argument the man wished to press.

“Swift. I ought to kick your skinny behind. You’re ruining everything our country stands for!”

“I’m afraid that I am going to need to ask you what you refer to,” Tom told the man.

“I’ll tell you what I’m referring to. You and your anti-Union rhetoric! Through your lies, you’ve convinced the government that a union job would be a disaster. That’s what I ‘refer’ to!”

Tom was nonplussed for a moment then replied, “Mr. Dumbarton. I am going to be very frank with you. You’re not going to want to hear it, but here goes. Swift Enterprises won this contract fair and square. Our bid was based entirely on our costs plus a very minimal markup. Our hope is to get this train finished and then to sell our technology to other companies.”

He paused trying to gauge the other man’s temperament. “We don’t intend to make a lot of money from this by gouging the taxpayers of this great country. We also do things a lot differently than you do where our employees are concerned.”

“What’s that supposed to mean?” Dumbarton barked at Tom.

“What that means is very simple. We pay our employees a good salary and treat them very well. We do not deal with trade unions. Take a look around you at one of your projects. For every ten workers you see, there are up to three non-working supervisors that you have to pay for. Why?”

“Because our union contracts demand it!”

“Okay. But they aren’t doing much, are they? They just sit and supervise. And, drive the project costs up! Your workers are hourly wage earners and only want to work as long as it gets them more pay. Every two hours they down tools and take a break, even if that negatively impacts the schedule or quality of work. My workers are valued employees. I know most on sight. They have better pay than yours, full medical, and all the benefits that they deserve. They are willing to work a few extra hours if it means the job gets done.”

“So do mine.”

“The difference is that you are paying your workers overtime, double overtime and even more. Even when they only need to remain on the job five minutes to finish something, they get an hour’s wage. And when the people doing the actual work are on site, the non-working supervisors are too. Everybody gets paid a lot extra and then you gladly pass that along to your customers.”

“Sonny, that’s the way America works,” Dumbarton told him with a growl.

“Then that is too bad. Nobody wins except the union organizers. I’ll give you a real concrete example of why our way is better. Take our J9 jet turbine engines. We build them on an assembly line just like the other manufacturers of similar engines. Our team can build two complete and tested jet engines every day. The union-run plants are barely able to get one out every two days. Spec for spec, ours cost our customers about thirty percent less.”

“What’s your point?” Dumbarton’s voice had lowered down to a grumbling level.

Tom could scarcely believe that the other man couldn’t see the point already. “The point is that my salary costs per engine are less than half of theirs. My parts cost the same; my fuel and test procedures cost the same. But I can sell my J9s at seventy percent the cost of one from, let’s say, Lexington Propulsion.”

“And that’s supposed to mean that a non-union scab shop is better?”

Taking a deep breath, Tom concluded his argument. “In all the years Swift Enterprises and the Swift Construction Company have been in business we have *never* had workers go out on strike. How about you, Mr. Dumbarton? How about *your* workers and factories and construction projects?” He waited for ten seconds, then added, “I didn’t think so!”

He finished with, “Mister Dumbarton? We have never discussed anything with anyone in the Government about union versus non-union. If you read the RFP you will see that it plainly spells out a single question of which type of labor we will be using. We added no editorial to that; just a simple tick mark in the ‘We will use non-union labor’ box.”

“I’m supposed to believe that?”

“Believe or don’t believe. I only speak the truth. If someone has been poisoning, as you put it, your reputation, it wasn’t anyone connected with the Swift companies. Guaranteed!”

With that, he hung up.

CHAPTER 15 /

GOING UP

TOM SAT at his desk, steaming over the phone call. *The very idea*, he thought. *To be accused of—*

He stopped. A thought occurred to him. Something Dumbarton had said.

“Excuse me, Trent,” he said into the intercom. “Please get that last call back. Thanks!”

While he waited, Tom went back through the conversation in his mind. He tried to remember exactly what the man has said.

His phone buzzed. “A very angry Mr. Dumbarton is on the line, Tom. Good luck.”

Taking a deep breath, Tom lifted the receiver. “Mr. Dumbarton. Before you yell at me and hang up, I think that you and I may *both* be the victims in all this.”

Following a quick pause, “What’s that meant to mean?” the man grumbled.

“You said something at the beginning of the conversation about my ‘poisoning your reputation’ with the Government, or something like that. Right?”

“Yeah. Said it then and I’ll say it again. You’ve been working with the Feds to give my company a bad name!”

“Well,” Tom said, “that’s just the point. I haven’t had any conversations or communications with the folks at the DOT about any of the other companies in this project with the exception of CanPacLant up in Canada. We had to take over their freight car construction after they went belly up. I’ve certainly never spoken to anyone about your company.”

He could hear a murmuring on the other end of the line, then, “So, how do you explain what I’ve been told? My contact at the DOT told me, point blank, that you have been telling the Secretary that Dumbarton Construction should be squeezed out and that your company takes over. Explain that.”

“I wish I could, Mr. Dumbarton. Who, exactly, is telling you this? I have a suspicion that I already know who it is. Would it be, by any chance, a woman?”

“How did you know that?” Dumbarton demanded, his voice indicating his surprise.

Tom told the angry man about the first problem Enterprises had during the bidding process. Without mentioning her by name, he told the construction manager about the ‘cease bidding’ call and how it had gone to the FBI for investigation.

He concluded with, “... and they have their doubts about the person in question, but haven’t found any absolute evidence that she was behind this. So, can you tell me the name of the person you have been dealing with?”

Dumbarton asked Tom to remain on the line while he called his attorney. Three minutes later he came back on. “The legal eagle says that I can tell you. Her name is Bjorgman. Sandral or Santle or something like that. Yours?”

“The same... Sahndal Bjorgman. I think that you and I need to agree to disagree about union versus non-union labor and set that aside so we can concentrate on making certain that this project is a success. I’m going to notify my Security chief about all this, and he will contact the FBI. Will you be willing to speak with them and relate the conversations you had with our Ms. Bjorgman?”

“You bet your a—uh, your life I will. Give ‘em this number. I... uh... maybe I owe you an apology on this—”

Tom interrupted him with, “No, Mr. Dumbarton. You had what you believed to be a legitimate concern for the welfare of your company and had no idea that you were being played. Until we actually meet I offer you a metaphoric hand.”

“Okay, kid. Me too. But I need to advise you on one thing. My union crews are not the sort of people to listen and make reasoned decisions. I’ve spouted off about this already and some of them might want to cause trouble if your teams and mine ever meet up.”

They concluded the conversation and Tom called Harlan. When the Security man heard, he was ready to hit the ceiling. Tom could hear him counting to ten—twice!—before saying, “I’ll get on to the Bureau. I suggest you give the DOT people a call and tell them what’s going on. It sure looks like the Bjorgman woman is out to cause problems for the entire project, not just our two companies.”

Tom’s call to the Department of Transportation was not a success. The Secretary was unavailable and his assistant suggested transferring Tom to speak with Ms. Bjorgman, but Tom knew any conversation with her would be unwise.

He thanked the assistant and asked that a message be left for the Secretary to please call him on his return.

Trying to get the Dumbarton calls out of his mind, he looked through his personal organizer and checked the list of items to be accomplished prior to the start of the actual project digging. As he scanned down the list, one item sprang out.

The G-force inverter adaptation for the rail cars.

Mentally slapping himself on the forehead, Tom sat down at his CAD computer and began calling up all the circuit diagrams for that invention.

I should have done all this earlier. Somewhere, he pondered, should be an easy solution to the problem.

The basics of each car self-weighting its load and balance could be taken care of by two small piezo-electric crystals, one in the front axle and one in the rear. As these were squeezed by the load in the box above, they would generate micro-voltage that could be measured. This, once compared to a database in the computer, would give the load within a tolerance of several hundred pounds, more than ample for his needs.

Tom took less than a half hour to design the entire 'scale' assembly. He called the electronics development lab and asked them to call up the circuit and make six of them as soon as possible.

Next, he decided to tackle the problem of which computer might be best for controlling the processes. Enterprises' range of 'Lil Idiots was the logical starting point. One model, designed specifically for heavy number crunching, would be almost perfect. He added that to his build list and then sat back in thought.

The trick was going to be tying everything together with the necessary software.

Hank Sterling dropped by to fill Tom in on the status of the freight car molds. Two sets would be available the following day.

"Go ahead and deliver them to Jake at the Construction Company. He'll get everything set up and going."

"Will do, Tom," Hank promised.

"Listen. While I have you here, can I bounce a couple ideas off of you?"

Nodding, Hank replied, "Of course. Shoot."

"Okay. The freight cars will automatically weigh themselves and a computer will adjust the inverter to take some of the load."

"With you so far, Tom."

"We can get speed details from the wheels using a simple

strobe effect. That way, the faster the train goes, the more the weight needs to be adjusted. What else am I missing?"

"Well, there's side-to-side wobble. Won't that affect the performance?"

"Of course. But I'm not quite certain how to measure that quickly enough to make adjustments in time." Tom looked thoughtful and disappointed. "Mercury tilt switches are out. First because of the lag time and inaccuracy and second because I don't want to have eight hundred cars out there each with an ounce or two of mercury in them. I'm not certain typical accelerometers will do what I need... they are maybe too sensitive. Plus, they all seem to be event driven and not continuous. Ideas?"

Hank moved over to sit down in one of the conference chairs. He stretched his legs out and put his hands behind his head. Tom knew that this was Hank's 'thinking' position, so he said nothing.

A couple minutes later Hank got up. "Can I use your phone?"

"Sure."

His pattern maker dialed a number and asked to speak to Mark Grado. Once he was put through he started the conversation. "Hey, Mark. Hank over at Enterprises. Listen. I've heard via the standard little birdie that you guys are working on a solid-state accelerometer. How's that going?" He listened for a moment then said, "And, it's pretty fast and accurate? What kind of specs?"

Again, Hank listened. Mark, at the other end, evidently placed the call on hold.

Hank turned to Tom. "This little gadget is going to revolutionize things like gyrocompasses and stabilizer systems. The darn thing is about the size of a large matchbook and—yeah, Mark. I'm here... it is?... Can you send me a couple of them? You may become part of something that will bring fame and fortune to us all. Can't tell you more, but we'll keep this company secret... Thanks a bunch. I know I've said this before, but I owe you. Bye!"

Tom sat waiting for Hank to tell him the results.

"We'll have a dozen of them tomorrow morning. Mark's overnighting them to my attention. I'll alert the mailroom to deliver them to you."

"Do you think they'll do the job?" Tom inquired.

"Well, Mark says that they measure acceleration in a totally spherically manner up to two hundred and sixty times a second. I'd say that might be enough. At least, I hope it will be. He said

that the next generation will be four times quicker but is at least two years away.”

Late that afternoon Tom received a call from the DOT. He informed the Secretary about the Bjorgman connection with Dumbarton Construction. He could hear how distraught the man was. The call ended with the Secretary promising to fully cooperate with the renewed FBI investigation.

The next morning, Tom was deep in thought on a change he wanted to make on the rail-laying mechanism when Hank walked into his office.

“I had to go sign my life away for these, so I thought I’d deliver them myself,” he said as he handed Tom a small parcel. “You might want to read the note.”

Tom pulled a single sheet of paper from the envelope taped to the package. He read it with a slight smile:

Dear Hank,

Since you work for some of the brightest and best in the industry, I’m kinda surprised that the Swifts haven’t already cornered the market on these.

Please impress on your bosses that we really, really need to be able to market these ourselves. We’ll be happy to sell them to Swift Enterprises at cost plus 10% in any quantity, but request that you refrain from coming out with one of your own.

I know that Tom Swift is renown for being a straight-up guy, so I am pretty sure that we will have no problems,

Hope you can tell me what top secret thing these are going into someday soon.

Mark

Handing the letter back to Hank, Tom remarked, “Please let Mark know that he has my word. As long as these work for our needs, Enterprises will be happy to buy them from his company. By the way, do we know how much they cost?”

“No, but I can find out.” He watched as Tom opened the package and pulled out one of the tiny devices. It consisted of a two-inch by two-and-a-half-inch circuit board with four

integrated circuit chips surrounding a one-quarter-inch square metal box. A single-three prong connector was mounted along one edge.

Tom pulled out the specification sheet and gave a little whistle. “These should be perfect for our use, Hank. Listen. I’ll jot down a thank you message to Mark later today. Can you make sure Trent has his address and mail stop?”

Hank agreed and left Tom to ‘play’ with his new toys.

In less than an hour Tom had built several wiring harnesses and had one of the accelerometers attached to an input port on the ‘Lil Idiot sitting on his test bench.

A few tests confirmed Tom hopes. The accelerometer devices would be perfect for use in the freight cars. Their reaction time, along with the calculating speed of the ‘Lil Idiot, could provide real time information that the inverter could use to keep the loads balanced.

Just before Tom headed home he received a call from the project manager at the Construction Company working to build the VBMs.

“Skipper. We have made the changes you requested and are ready to deliver the first of the final Shrews and Spews. Did you want to come over and give them the once-over, or should I ship them out to California?”

Tom thanked the woman and asked that she hold them overnight. “I’ll come by around nine tomorrow to check them out. I just feel better if I can run my hands over something.”

She laughed at this and agreed, adding, “We’ll see you then.”

As he promised, Tom arrived on time and walked into the manufacturing building where the VBMs would be constructed.

His steps faltered as he looked over at the pair of machines nestled in their cradles. Both were jet black and coated in a new formulation of Tomasite that utilized an integrated carbon-fiber mesh to provide an even higher level of strength than Tomasite alone.

As he approached, Margaret Eisen, the line manager, came over to greet him. After shaking hands she turned and motioned with her right hand, “Aren’t they magnificent looking, Tom?”

He nodded and then walked up to the taller of the two. This was the first of the Spew units that would coat the inside of the vertical shafts. He had to laugh when he walked around the machine and saw the model and serial number plate that was

riveted to a lower inside panel.

He glanced at Margaret who was standing there looking slightly apprehensive. She had one knuckle in her mouth as she waited for his reaction.

What caught his attention was the wonderful caricature of an actual shrew holding a bucket in one forepaw and a paint roller in the other.

“I’ll bet I can figure out what will be in the other one,” he commented with a smile.

Margaret relaxed. She had been worried ever since Bud had approached her with two drawings he had asked Bashalli to provide. She had them etched into the plates and then Bashalli had come in to paint them with a special baked-on enamel that could withstand just about anything that might happen.

As he thought, the other machine had a similar plaque, this one with the same shrew-like animal only this one was gnawing on a large rock.

When Tom completed his walk around of the machines he was pleased to see Bud and Bashalli standing with Margaret. They had crept in while his attention was on the equipment.

“I think I now know who’s behind all this,” he said as he walked over to the group. Pointing at Bud, he said, “My guess is that you are to blame, and you,” he swung his finger around, “are the beautiful, dark haired mystery girl who did Bud’s dirty work. Right?”

“May I take that as a thank you, Thomas?” Bashalli asked him as she gave him a hug.

“You may. So, Bud. You’re now going into the business of turning your pun names into visuals?”

Bud hung his head in mock shame. In a very poor English accent he said, “Guilty, your lordship. But I got me an extenuating circumstance, you see. It’s like this. I was tricked into it by this blond girl. She ain’t here now on accounts of her looking for decent employment, but I swear to ya, it were she what done it!”

Tom reached out to place a hand on Bud’s slumping shoulders, and then gave him a quick clip above the ear. “That’ll learn ya!”

All four took a more detailed tour of the two devices with Bashalli asking questions about how they would be used. She had created the caricatures merely from Bud’s basic descriptions.

When the others left, Tom had pronounced both devices ready for production, and Margaret promised to have the line running

by the following Monday.

Both the Shrew and the Spew Tom had seen were delivered to the entrance of the California dig site two days later. He and Bud joined the team out there to run through how they would work and any troubleshooting that might need to be accomplished.

As they were both slightly wider than the ill-fated prototype, Tom opted to take them into the tunnel and to raise the Shrew up and into the hole created by the earlier, disastrous attempt.

The hydraulic lift was positioned under the shaft and was used to raise the device into place.

“I’m not sure why, Tom,” Bud said, “but I imagined that the shafts would be up at the top of the tunnel arches. Maybe the first one in the left tunnel and the second in the right.”

Motioning at the tunnel roof just ten feet above the central platform, Tom replied, “The computer model shows that putting them here in the middle means that any one is more effective when two trains pass one another than having them over the tracks. That, plus it makes it a heck of a lot easier to move the collection box into position.” He pointed at the circular metal tank outfitted with four wheels.

“We just drag one in position and the wheels—powered by hydraulic rams—move together and push the thing up tight against the roof. We can collect better than ninety-nine percent of everything that comes back down that way. A good vacuuming will take care of the rest.”

“And, the tunnel debris from the Gopher?” Bud inquired.

Tom replied, “I did a little tweaking so that all the non-vaporized debris is deposited right on this platform area. It will now be about a fifth of the first test dig. A little lip will be molded into the rest of the tunnels that will let us scoop the stuff up, load it into the containers, and get it ready to be pulled up the shafts.”

Tom gave the signal and the collector was moved into position then raised with the push of a single button. Seconds later he pressed the Start button on a wireless remote control. They could hear the Shrew begin to work.

Soon, the sounds were almost indistinct as the device headed higher in the shaft.

“Up, up and away!” Bud exclaimed.

“Let’s head out and take the Skeeter to the top opening. I want to make sure that the Shrew stops and reverses correctly.”

“Skipper. I don’t want to be an annoyance, but I have a

question.”

“Shoot.”

“Okay. You’re using an earth blaster in the thing, right?” Tom nodded. “And, it puts out a really high intensity and hot beam that vaporizes everything it touches. Right?”

Tom smiled and nodded.

“Alright then. What happens to anything directly over the hole when it pops up? Instant death to some poor mountain goat or down comes an unlucky aircraft?”

“Glad to know you’re thinking about important things, but there is no need to worry. Firstly, the beam is set to focus all of its energies within a tightly defined area. Get more than about five feet outside of that and all you might get is a blast of heat that would drive any sane person back.”

“But, what about the goats?”

“We sent recordings of the sounds and the rumbling these things create to the Department of The Interior, and their experts assure us that any animal within a hundred feet of the point where the Shrew will pop up will scamper away before the thing gets to within thirty or forty feet of the surface.”

“I’m glad to hear that, Tom.”

“Yes. I know. You were worried about the goats!”

CHAPTER 16 /

THE NEW MACHINE

TOM KEPT the others behind him while he switched on the overhead lights. Sandy and Bash let out little gasps while Bud could only manage a low, “Wow!”

It was a week later. The vertical test had been a rousing success. Shrews and Spews were coming off the assembly line and the final three TBMs were almost finished. Once they were delivered, the tunneling could begin in earnest.

In front of them stood the first of the new locomotive engines. Standing at over 15 feet tall and 9 feet wide, it featured a long, sloping nose that tapered down into a smooth, rounded point only two inches above the ground. It went back just over 70 feet.

On top sat a tinted canopy, stretching back twenty feet, worthy of installation on a jet fighter. Behind the canopy the fuselage—nobody who had seen it could think of it as merely a ‘body’—sloped up another fifteen inches and ended abruptly thirty feet further back.

The fuselage curved under at the bottom giving the entire assembly almost an aircraft look. The wheels were hidden inside of aerodynamic covers that stretched to within three inches of the tracks.

“It’s utterly—” Bashalli was at a loss for words.

“Completely... uh... gee—” was all Sandy could say.

The foursome walked around the engine pausing at several points so that Tom could describe special features. At one point he opened a small access hatch and clicked on a switch. He invited them to run their hands over the skin of the engine.

“It’s so smooth, Tom,” Bash commented. “My hand just floats over it.”

Tom grinned. “That’s a little trick we’re playing using static electricity. There is a positive-to-negative charge change that happens one hundred times a second. It has the effect of repelling anything that comes to within a half millimeter. This way, no dust or dirt or even rain will stick and cause additional drag.”

If his friends thought they were impressed by the outside, they were doubly shocked when Tom opened the side door near the rear of the engine and ushered them inside.

A short stairway opened into a small but comfortable-looking lounge area featuring a pair of computer stations, a big-screen television and a small kitchenette. He opened the door at the back of the lounge and showed them the small bunk room with four beds and a bathroom with shower.

“How many people will... is *pilot* the correct term?” Bashalli asked.

Tom thought and then nodded. “That’s as good a term as any,” he told her.

“So. How many will be piloting this?” she asked.

“Because the train won’t stop, and latest federal rules say that nobody can drive or pilot a train for more than four hours at a time before they take a half-hour break, and then only be on duty a total of ten hours a day, the trains will need to have a crew of at least four but more likely six,” he explained.

They moved forward through the lounge and through another door. A narrow hallway ran another fifteen feet ending in yet another door.

“What’s on the other sides of these walls?” Sandy asked.

“The power plants. A pair of electrical generators powered by our new Y-8 engines. Basically,” he started to explain before anybody could ask, “an up-sized version of the little Y-4 that Bud drove a couple months ago.”

He described how the engines would run continuously to turn the generators that provided electricity for the eight motors, one in the axle for each wheel.

They opened the final door and walked into the control room. More like a futuristic spaceship than a train engine, it featured four stations: two were accessed via a short stairway and held the seats for the engineer/pilot and his co-pilot under the canopy, with a systems engineering station that would generally be unmanned, and the communications station on the main level.

The tinted canopy flowed overhead and allowed an almost complete field of vision for anyone in the pilot seats.

Bashalli and Sandy sat in the comfortable seats trying to take everything in. For more than ten minutes they sat in silence. Finally, Tom asked, “Isn’t anyone going to ask what’s up front, in the nose?”

Bud raised his hand. “Yeah, that question, professor.”

“Fuel, water, spare parts, a small machine shop in case of emergencies and a lot of air. Since it hangs out over the front-

most set of wheels we need to keep the weight down, only not so low that the nose might want to float up.”

“So this pulls the entire train, Tom?” Sandy asked.

“This is one of the components. There will be a duplicate at the other end effectively pushing the train at the same rate the front one pulls, and for every twenty-five cargo cars, one will be a quarter-size car that contains a single engine and generator powering a pair of wheels.”

“Any control issues, skipper?” Bud asked.

Tom indicated that there would be no problems. “All computer controlled and balanced with a triple redundancy for all systems. Plus, a high-speed wireless backup system. The train would have to be pulled violently apart and the middle separated by more than a mile for there to be a loss of communication and control. Plus, it would auto-stop.”

“How many people did you say are necessary to operate this magnificent machine, Tom,” Bashalli asked.

Tom lowered his voice. “Technically, these could run themselves using just the computer control plus monitoring by a central control station along the way. But, the train operator’s union, and the railroad company that will be taking charge of these once everything is complete, insist that there be jobs for at least three people per train at all times.”

He shrugged as if to signify that it was out of his hands.

Next, he gave them a tour of the first of the cargo cars now sitting complete in the adjoining room.

Running his hand over the side of the car, Bud remarked, “Same ultra-smooth surface.”

Tom nodded. “Right. We need to keep the slippery factor going from front to back. The reason you can feel it on this car is that we are doing a test on the battery redundancy package. I’m pretty sure that one solar battery will be able to maintain the PNP—positive to negative to positive—charge even if power from the generators gets interrupted.”

They looked inside the car. Like its traditional ‘boxcar’ predecessor, it was primarily a large, hollow rectangle. This car would be able to carry almost 60% more cargo per car than the old cars.

“Plus, they are about fifty percent lighter so engine power isn’t going to have to drag along so much ‘dead’ weight,” Tom explained.

“I thought these were going to be curved on one side. What gives?” Bud asked.

Somewhat sheepishly, Tom admitted, “I hadn’t given thought to how the cars would react outside of the tunnels. That bulge lets us carry more cargo and works great in the curved tunnels, but the turbulence it creates when not right up next to a wall is overpowering. Plus, it throws the balance off. If the inverter ever goes out, that old design would almost certainly mean that the train would fall over under its own weight.”

He told them how a small-scale wind tunnel test had shown that such cars would have an aerodynamic effect and would want to push over to the opposite side.

“Like a wing, huh,” Sandy offered.

“Just like a wing, Sis.”

“So, Tom. What will happen if you don’t have the curved side when the trains are inside of the tunnel?”

“Well, Bash. We had to run lots of tests, but I believe we’ve found the answer. First,” he told his friends and sister, “having such tall cars with all of that space to the one side causes far too much turbulence. So, I just decided to block it off.”

“Does that mean the whole digging head with the earth blasters has to be rebuilt?” Bud asked.

“Nope. I’ve simply added a new piece to the foam coating machinery in the back of the TBM. We’ll coat the curved area and then build a partition out away from it to a point where it will be just ten inches from the side of the trains.”

He went on to describe that the partitioned area, rather than being totally closed off, would have a 2-foot wide, top to bottom, hole left open every 50 feet.

“That way, we can use the extra space to help balance the pressure in the tunnel. Plus, and here’s the great part, we can go back to placing vertical shafts every fifteen miles or so, rather than every ten like I was afraid we might need. You see, the air pressure that might want to build up in front of the train will be shoved to the sides by the nose of the engine. The openings in the outer wall will let some of that pressure slip out and back down to a point behind the train.”

“Will that take care of all the pressure buildup?” Bud asked. “And the exhaust fumes?”

“No. But the amount of pressure that remains will be handled by the vertical shafts. In fact, now that I think about it, that

pressure will do away with the need to put high-capacity fans in the shafts. The pressure will be sufficient to push out the 'bad' air and the partial vacuum that develops behind each train will suck fresh air down from the shafts the train recently passed under. The only time there will be any noticeable pressure is when two trains pass. They might feel a slight sideways bump, along the lines of a quick inch or so and then back to normal."

"Win-win?"

"Yep. All the way around I think." Tom pulled out his ever-present calculator and ran a series of computations over the next few minutes. After he finally pushed the 'Total' key, he looked at them, evidently pleased with the results.

When pressed for what he had been computing, he admitted, "I've been holding off running some final numbers regarding the total amount of drag for the trains. Old-style trains have a drag coefficient of about two. Roughly the same aerodynamic drag as a brick. Not so good. And, a really sleek car has one of about point two three. It is one of the reasons that racing cars can go so fast. We needed to achieve a drag of no greater than point two three in order for everything to work properly, especially if the trains ever are asked run at the top speed of two hundred miles per hour."

"Then," Sandy ventured to ask, "what about the Tom Trains?"

Proudly, Tom showed them the results on the screen. "Point one two seven," he announced.

"How does that compare to other bullet trains?" Bashalli asked.

"Well, I don't remember the exact figures, but I seem to recall that the French TGV is about point two five and the one in Japan something like point two two."

"So, yours is definitely superior. I knew that would be the case," she declared looking at Tom proudly.

"Alright, Bro, what about the inverter thingie?" Sandy asked.

"After all the information from the various sensors gets crunched in the computer, that sends the signals to the inverter emitters mounted over the outer four wheels. Minute adjustments are made so that each corner is kept almost perfectly level with the others. Within one millimeter if all goes well. In the few places where we need to lay long curves, the inverters will compensate by raising the outside of each car by an inch or so, then they go back to level once the curve is complete."

"How is that computed, Thomas?" Bashalli wanted to know.

“Hank Sterling was able to get us some accelerometers. They measure any motion forces, disregarding the purely front-to-back motion, and then send the data to the computer. That communicates with the lifters, and so on.”

“Okay. I’m with you... mostly,” Sandy said, “so how to they actually do the lifting?”

“Inside each track we are running a quarter-inch hollow nickel-chromium tube about a half-inch under the top of the rail. It is filled with our Serpantium gas to provide the reaction. Each wheel on the cars is also filled with a ring of the gas. The inverter interacts with it to provide the opposing forces. All we need to do is increase or decrease the power—by microvoltages—and it’s either up or down.”

“Why not use repelatrns?” Bud asked.

“Mainly because at the points where our tracks stop and another company’s begins, they will be using solid steel. No matter how fast we try to switch from one repulsive force setting to the other, we just can’t do it quick enough to keep the cars from suddenly bottoming out and then being flung back up. The computer model crashed every time! With the wheels providing about seventy percent of the lift we avoid the problem.”

They all agreed that was not an acceptable result.

“Want to go over and watch them assemble one of these cars?” Tom asked the group.

They eagerly answered so the four friends walked to a building several hundred feet away.

As they stood inside of the doorway, Sandy and Bashalli let out little gasps.

“Oh, my. Look at that!” Sandy exclaimed.

Their attention was focused on two half shells that were in the process of being lifted and tipped together using a series of overhead track cranes. They watched as both halves met and were then pressed together by a series of armatures that rose up from the floor.

Another arm fitted with a device that emitted a very intense light positioned itself at the lower front of the seam and then began moving up and over the top, disappearing down the rear of the car two minutes later. A minute after that it reappeared from under the car.

“That,” Tom explained, “sets the bonding material—basically a gooey version of what the shells are molded from—so solidly that

it ends up slightly stronger than the rest of the car.”

They walked down the assembly line stopping to watch two of the ‘pressing’ arms rotate to bring up suction arms. These picked up the two doors, tilted them for insertion, and then brought them smoothly up against the inside of the car.

Tom explained that the brackets and gliding tracks snapped into position on their own, and that technicians would permanently adhere them further down the line.

By the time they left the building thirty minutes later they had watched the basic box being outfitted with its array of sensors, cables run, computer module installed, and everything connected to the set of trucks on which the cars rested and the wheels were attached.

“Color me impressed, skipper,” Bud stated.

The girls agreed. They left Tom and Bud to go back to Enterprises while they announced that they were going shopping. Sandy had found a job working for a local company and wanted some new clothes.

When Tom and Bud inquired where she was going to work, she shook her head and told them, “I want to get my feet under me for a few weeks. Then I’ll tell you.” And, with that, the girls drove away leaving the boys to stand, scratching their heads.

Tom dropped Bud off at The Barn where the flier was due to take a test flight in a modified SE-11 Commuter. Rather than having a pair of jets engines mounted to the upper wing, this adaptation featured rear-facing turbo-prop engines.

Where the SE-11 was capable of near Mach speed, this version would have a top speed of just under 400 MPH and would cost 20% less. Today’s flight, Bud described to Tom, would be to test the overall power available. He would be taking the plane into a vertical climb and see just how high she would go before stalling out.

“It will also give me the chance to test how easy she is to pull out of a spin,” he explained.

Tom left him to it, heading for his office.

“You need to get in there quickly, Tom,” Trent told him as Tom sauntered into the outer office area. “The DOT and FBI are on a conference call with your dad.”

Tom opened the door and crossed quickly to his father’s desk. Damon looked up with obvious relief in his face. He motioned Tom to sit and then pressed the button to activate the

speakerphone.

“...but we don’t know. At least, not right now,” an unrecognized voice was saying.

“Special Agent Davidson,” Damon broke in. “Mister Secretary. My son, Tom is now in on the call. I’ll fill him in on details later, let’s just continue.”

“Hello, Tom,” came the voice of Jonas Markham. “I will give you a quick recap. Agent Davidson is with the FBI’s special branch dealing with industrial fraud and espionage. He and his team have been able to determine that Miss Bjorgman is almost certainly the person who generated the false memo, and we already know she made that call to you trying to get the Swifts to back out of the project.”

“Yes, Tom,” agreed the agent. “And, it’s Brian Davidson. The truth is that we messed up in the original investigation. We missed at least one major piece of evidence. Thanks to you and Ben Dumbarton, we reopened the case and found what we had missed.”

“Well, that’s good, I guess. Where does that leave us now?” Tom asked.

“That’s what we were just discussing. I was telling both the Secretary and your father that we served a wide-ranging search warrant on Miss Bjorgman’s offices and her home. We discovered a draft of the memo as well as several pages of practice signatures. All of it is pretty damning.”

“What does she have to say for herself?” Tom asked.

“Hmmm. That’s the problem. She disappeared yesterday and we haven’t been able to get a handle on her whereabouts.”

“It looks like she was tipped off by someone, Son,” Damon told Tom.

“Right,” the DOT Secretary added. “Her assistant says that she received a brief phone call yesterday and left the office moments later, taking a small box of papers. The woman hasn’t seen or heard from her since.”

Tom thought about the recent sabotage events before commenting, “I guess that means that we have a real problem. Not only is Sahndal Bjorgman—assuming that is her real name—out to get Swift Enterprises, but she may have an accomplice somewhere out there who is even more dangerous!”

CHAPTER 17 /

CAVERN OF DOOM

EVERYONE was silent for a moment. There was little else to say. Finally, Agent Davidson cleared his throat and spoke.

“We’ve started following up on that phone call, but it evidently came from an unregistered cell phone, one of those burn phones. I expect that we will be able to at least tell the location of the caller once we fully analyze the phone company’s records.”

The call ended with everyone agreeing to be in immediate contact should anything new arise.

Tom and Damon at looking at each other after the call was finished.

“One of the things the Secretary told me was that Swift Enterprises is to consider that any communication other than from him or his Deputy Secretary, in person or on the phone, is to be disregarded. We have a free hand in finishing up our portions of the project. Speaking of which, we now have just twenty-eight weeks until everything is supposed to be finished. As I understand it, Dumbarton Construction has a good handle on their portions of the Midwest above-ground tracks.”

“What about the other companies? Slaker and Mid-West Construction. Do we know about their portions?”

Damon shook his head. “Evidently they are keeping pretty mum about their progress. The DOT is sending an inspection team out in the next week or so to look over what they have accomplished. I suppose we’ll know then.”

Tom filled his father in on the progress of the freight car construction, which the older inventor welcomed as very good news indeed.

“When do you start the actual tunneling, Son?”

Tom grinned. “I’m ready to start tomorrow. The last three fully-outfitted Gophers are sitting and ready to be transported.”

“Where do all the different TBMs go?”

“Two of them go out west. Number One goes to California and Two to Nevada. They’ll meet up in about forty days, and then we’ll reposition them for the Rockies tunnel. Number Three is already in the hole in Binghamton and continues on with that bore. Number Four goes in the other end of that hole—the northern

corner of Ohio—and the final one will do the tunnel from Nevada to Utah on its own. It's the shortest of all the tunnels."

"Which one will dig the Mississippi Valley tunnel?" his father inquired.

"I think Number Four will start to dig the Mississippi Valley underpass from the East. Whatever other TBM gets finished and ready to ship first will then come in from the West to finish that tunnel."

"Is your schedule going to get this all done on time?"

Tom nodded. "Unless we have a major setback, all our tunnels will be completed and ready to link up with the Dumbarton and Slaker lines at least two full weeks early."

Damon raised an eyebrow and looked pointedly at Tom. "That close?"

Tom shrugged. "We've had tighter schedules before. Besides, I've decided to deliver more than the first six hundred freight cars along with the engines and mules right on time."

"Mules?"

"The shorter, interim engine cars that will go between every twenty-five boxcars," Tom replied.

"Oh, yes. I remember now. Well, good. You seem to have everything in hand. That will let me concentrate on this Venus probe project."

"How is that going?" Tom inquired. Mr. Swift had been working for many months on an ambitious probe and experiment package that would be launched in just two months for a Venusian landing the following year. Along with the typical technical issues, Mr. Swift had been dealing with the problem of a security leak and possible protests over the use of a nuclear power source.

"Fairly well. It is a mercy that we have the ability to try out a lot of the experiments in the package out in space. We know everything will survive the icy vacuum during its trip. I only wish that we had a non-radioactive environment to simulate the heat and enormous pressure that things will be under once the probe lands."

Mr. Swift departed the office a minute later leaving Tom to consider whether his schedule might be cutting things a bit close. "Nothing I can do except maybe run the Gophers a little faster," he said to his father's empty chair.

Over the next week Tom managed the breakdown, packing and

shipping of the final three TBMs along with their contingent of Shrews and Spews, collection containers and other associated support vehicles and personnel.

He personally started up each of the TBMs and piloted them for at least one mile into their tunnels. During each run, the other operators crowded into the small control rooms and watched Tom handle every one of the functions.

Next, he allowed each person to pilot the digger at least one mile on their own. Only rarely did he need to step in to make a minor course or speed correction. By the time he had finished with all five Gophers and their crews, he was satisfied that things could be turned over to his men.

Tom really wanted to set this project aside for a month or so and work on something that had been playing around in the back of his mind for months. It had been brought to his attention that the runways of Swift Enterprises were reaching the end of their certifiable life. Here and there, the asphalt had begun to crumble near the edges.

There must be, he reasoned, a way to revitalize all of those thousands of tons of paving short of breaking it apart and replacing it wholesale.

FAA regulations wouldn't let them simply grind away the top inch or so and lay down a new covering as was frequently the case with automotive roads.

Well, that would all need to wait at least another week or so.

He decided that his next best use of time would be to visit the sites of the other three companies' work to ensure that everyone's tracks would be lining up with the micro-precision that was needed.

His visit to the three-hundred miles being laid by Mid-West Construction—that portion running from the exit of the Rockies tunnel and running across Colorado where it connected to the Slaker Industries tracks stretching through the tip of Kansas and into south Nebraska—went well.

It was at the Slaker line where he was met with a coldness that greatly bothered Tom. Mr. Slaker would barely make time to talk with him, even though Tom made it clear that he was just there to make certain the Enterprises line and the Mid-West line were going to align with their already-completed first hundred miles of track.

“Not sure what you really want, son,” was the reaction from Slaker, “but I've got better things to do than stand around jawing

with some young pup who purposely underbid me and then used his friends and *contacts* with the Washington brass to grab the lion's share of this project!"

"Mr. Slaker. I'm not certain where your animosity is coming from, but I can assure you of two things. First, Swift Enterprises *never* takes advantage of any business or personal relations we might have. Everything we do is above board."

Slaker snorted and started to turn away.

"And, second, we only have those portions of the contract that we bid on, mostly portions I must remind you, that no other company would consider given the timeframe. That includes your company. As I understand it, you didn't want anything to do with the tunnels. The extra parts of the project were ones we picked up when two other companies either backed out or went bankrupt. They were also offered to you. If we hadn't come in, this project would be dead and your contract would have been cancelled by now, as would ours."

Slaker moved past Tom, bumping him slightly as he went past, and headed for the door of his management trailer.

Tom followed him outside. "Mr. Slaker," he called after the departing man, "so far in this project I have been lied to and pitted against one of the other companies. If you have some grudge against me, at least be man enough to tell me why!"

Slaker stopped, his shoulders rising up as if being stung by Tom's last words. He spun around and stalked back to the waiting inventor.

"Okay. Cards on the table. One, I don't like you. Two, I have my sources that tell me that you're out to grab all the glory for this project. I even hear that your PR people are calling a press conference next week to announce that your precious Swift Enterprises is saving the world, yet again, from companies that can't be trusted to complete a simple rail project!"

Tom was stunned and his mouth fell open. Before he could get out anything, Slaker continued.

"Three, my company could have laid the tracks in your tunnels faster than you can dig the damn things! And, four... I really, really do not like you!"

The man stood in front of Tom, chest heaving, his face having gone bright red.

Calmly, Tom took a half step forward and spoke. "I can't do anything about your numbers one and four. As a matter of fact, I got over the need to have everyone like me a couple years ago. As

for number two, if you will contact Ben Dumbarton about your *sources* you might be surprised. He, too, thought that he had a good inside source that was telling him how Enterprises was out to ruin him. Turns out that a DOT person has it in for all of us. Your source may even be that same person who is spreading lies and innuendo. Why? I have no idea.”

Mr. Slaker’s shoulders dropped a little and his breathing was coming out less in great blasts and more in normal breaths.

“Also, my PR people are under the same ‘no tell’ order from the DOT as you and I are. There are no plans for any press release or conference or any announcements. Now, as to your number three... I have no doubt that you might be able to lay tracks at a rate greater than our boring machines can create the tunnels, but due to the nature of the coating we are using to resist the incredibly high pressures and heat, there would be no way for you to anchor the rails to the bottom of the tunnels. They absolutely have to be incorporated into the tunnel lining, something that not even your company would be able to do. I’ve said my piece and I guess you have, too. Go ahead and dislike me if you need to. Just understand that Swift Enterprises is a reputable company and we never, under any circumstances, do anything to harm any competition. We might underbid them, and that is *always* based on our real costs, but we never undercut them.”

Slaker looked at Tom. There was still anger in his eyes, but Tom could sense that the older man had cooled down.

“Now, unless you want to pick me up and toss me off this *Government* property, I am going to take a half dozen GPS readings to ensure that my tracks and the Mid-West tracks are all headed to the exact spot where they will meet yours.”

Tom turned away and walked from the confrontation.

He removed a single instrument from his vehicle and walked to the end of the Slaker-laid rails. He took a reading at the outer edge of one rail and then another at the outer edge of the other. For each rail he also took readings at measured distances straight out from the ends of the rails and perpendicular to the ends.

As he was climbing into his car he looked back at the construction company owner. Slaker was still standing there, but he was looking more nervous than angry.

Tom drove away heading back to Shopton and the start of his side project: the asphalt re-paving machine.

Two weeks later, Tom set aside his asphalt project ideas and headed back out to California. He was anxious to get into the tunnel and ensure that everything was going according to plan.

Now was the time to make any small changes in direction.

He arrived later that day and was directed to Hank Sterling, who was acting as project manager for this end of the tunnel. Hank was working in a large trailer and had just hung up the phone when Tom came in.

“Skipper!” Hank greeted him. “Great to see you. To what do we owe the honor?”

“I figured that you would be about ready to shoot up the first of the shafts, so I wanted to come out and be part of it.”

Hank nodded. “Glad to have you. Say, I’ve got one of the drivers, Frank Sallis, who has a very pregnant wife back in Shopton. It seems that little Sallis wants to come early and I’ve been dreading having to leave this nice trailer and taking his duties for the next few days. Any chance—”

Tom laughed. “Consider me the duty relief, Hank. Take me to your Gopher!”

They went outside and into the mouth of the tunnel, There, along with several support vehicles and the small, portable plant that was mixing and preparing the tunnel lining foam, sat a pair of the sleek little rail racers.

Tom hadn’t had the opportunity to see a completed car before they had been shipped out. He walked over to one with a bright green stripe and ran his hands over the top.

“Nice, huh?” Hank asked.

“Absolutely beautiful,” Tom replied. “Do they work as advertised?”

Hank favored Tom with a huge grin. “Oh, even better, skipper. Even better. These things are so smooth that the only indication that you are shooting forward are the vent cutouts in the sides of the tunnels and the occasional work light. They go shooting by, but everything else seems to be standing still.”

The two men climbed into the rail racer and Hank took the controls. He radioed, “Speed Buggy Green coming down the tunnel. Are we clear?”

“Give us one minute, Green. We have some debris from vent number two that needs to be cleared.”

“Roger. Give me the go ahead when you’re ready for us.”
“Roger...”

“How far in is the TBM?” Tom asked.

“We’ve been able to keep up a speed of about a fifteen hundred

feet per hour. So far we've gone in almost fourteen miles. We received your new shaft data and put the second one at the ten-mile marker. All the rest will be spaced at fifteen-mile intervals after that.

The radio came to life. "Green? We're ready for you. Suggest you begin to slow at marker eleven."

"Thank you. Green is coming in!"

With that, Hank slid a finger up the accelerator control in front of him and the little car shot forward.

Grinning at Tom, he asked, "Feel that?" Tom nodded. "Well, here is where we set our traveling speed. Right now we're limited to sixty miles per hour." Hank made an adjustment to the acceleration. "Now what do you feel?"

Tom smiled. "Wow. You're right. If we didn't have those vent in the side wall to look at I might believe we were just plugging along at a snail's pace.

Eighteen minutes later Hank began slowing the little car. A few moments later they flashed past the work crew that had just finished the shaft cleanup. Tom caught a glimpse of the Shrew VBM sitting in its wheeled cradle. He assumed that the liner-coating Spew was up in the shaft, doing what it was designed to do.

Shortly, they arrived to within a few hundred feet of the rear of the Gopher. Even though most of the massive machine was inside the tunnel ahead, Tom could still barely believe the massive size of the thing. It practically took his breath away.

"Let me tell the guys you're going to be filling in for Peter, and then I've got to head back. Things to do, you know?"

A few minutes later, Hank and Frank Sallis, with the assistance of a clever pneumatic jack and turntable system Tom didn't remember making, had the green car racing back out of the tunnel.

"I've got to ask where that came from," he said only loudly enough for himself to hear.

Frank had been part of the two-man crew following the TBM and making certain the lining material was smooth and even and vacuuming up the occasional debris not captured in the trailing container. Tom took over that duty until it was his turn in the control room, several hours later.

He had been at the controls for an hour when Hank returned, bearing hot coffee and sandwiches. When he popped into the

control room, Tom remembered to ask about the turntable.

“Oh. That was designed by your dad. He said he figured you would have gotten around to it once you came out here, but thought we might really need it before then. Got to go. Bye!”

Tom ate his sandwich in thought while keeping a close eye on the controls and readouts.

As his TBM continued to move forward, Tom suddenly noticed a disturbing readout on the control panel. One of the tunnel-cutting blasters, the right one, wasn't registering more than half the normal amount of vaporized rock exiting through the system. Suddenly, the reading dropped to zero! He stopped the machine.

Getting out of the control cabin and heading back along the tight walkway, he exited the machine. Tom told the follow-on crew his reason for stopping the machine.

“I'll go poke my head through the access hatch and see what's going on. Guess you guys can take a break.”

Tom returned to the control cabin and walked to the far right side. He moved the security latches aside and opened the three-foot by three-foot hatch. He turned on the set of bright inspection lights.

What Tom saw as he stuck his head through the hatch made his blood run cold.

He looked down into an abyss.

The right side of the TBM had broken through into a cavern of some sort. Tom moved the lights around and could immediately see that they were in trouble. The cavern extended farther up and down than the lights could reach. He could see that another rock wall—encrusted with quartz and other minerals—was about fifty feet in front of him.

He returned to the team and told them of his findings. They stood in silence while the enormity of this unplanned problem sank in. Finally, one of the team spoke up.

“So, we bring in a bridge, right?” the man Tom recognized as a Swift Construction Company employee suggested.

“I wish it were that easy, Dan. While we can back the TBM up, we can't go all the way back and pull her out of the bore while we wait for a team to build a bridge and move it down the tunnel. We don't have the luxury of that much time.”

They immediately saw that he was right.

“What do we do now?” the same man asked.

Tom thought. “We’re going to need a lot of different equipment, but I think we can set up in front of the boring head and build Dan’s bridge ourselves.”

He described his plan. The team was hopeful, but everyone knew how difficult the task would be, especially if, as the other man pointed out, the wall Tom could see wasn’t actually the far side of the cavern. If it were something thin and insubstantial, or if there were an even wider chasm beyond it, they were definitely in trouble.

Two days later the necessary equipment and supplies arrived. Everything they would use had to be passed along the TBMs corridor, through the right-and left-hand hatchways and then staged on the wide but short ledge made when Tom backed the Gopher up about twenty feet.

The first thing Tom did was to set up two laser levels showing where the left and right tunnel bottoms must be located.

He used a small hydraulic extension arm to take one of the smallest of the earth blasters over to the other side about ten feet above and several feet to the left of the top of the necessary tunnel. Using it more by guesswork than precision, he bored an 8-inch hole more than ten feet into the rock.

Tom was happy to find that there was at least that much solid material on the other side.

A second hole on the opposite side was created before Tom pulled the tiny machine back. Again, using the arm he pushed out and sank home a pair of heavy-gauge expansion bolts into the holes. From these he had previously attached high-load-capacity cables.

He withdrew the arm and turned the next steps over to his team. Tom was mentally and physically exhausted.

Dan and the rest of the team used the arm to bore corresponding holes ten feet above their existing tunnel bore. Two more anchor bolts were firmly embedded and the cables were attached.

During the following days, another pair of cable and anchor sets were attached to the lower outside of the tunnel. These, in turn, were connected to the upper cables by a series of connector posts made from Tom’s Durastress. Next, a series of plates were created, moved out onto the lower cables and attached. These would provide the necessary ‘roadbed’ onto which a 2-foot-thick slab of the DuraFoam was poured.

Tom gave everyone the next day off. He knew that the next

step would be both vital and potentially deadly.

He climbed into the cab of the TBM once they returned. Tom inched the machine forward until it was directly at the entrance to the cavern. Taking a deep breath, he muttered, "Here goes."

The TBM began moving forward and onto the 'bridge.' Tom knew that it would support the weight of the machine, but didn't know for how long. Foot by foot the huge machine came out of its tunnel and over the abyss.

Beads of sweat began running down Tom's face.

Ten minutes later, and with almost half of the entire length of the TBM on the makeshift bridge, Tom activated the front boring array. As it reached the point within a few inches of the nearest rocks, Tom could see on his screens that the blasters were doing their work. In minutes the entire array had entered the new tunnel and a minute later, Tom and the control cabin did likewise.

He radioed his elated support team of the success.

Although they had incurred a delay of five days, Tom was confident that they would be able to complete the tunnel under the Sierra Nevada mountains almost on time.

He arranged for another team from Swift Enterprises to come out to fortify the bridge and to make it a permanent part of the structure. They would pour additional material onto the bridge, strengthening it, and would lay the tracks as well as create safety guardrails on either side.

Tom and his team pressed on. Within the next ten days they had made up for at least one of their lost days. With eighteen days to go before they should meet up with the eastern bore, Tom excused himself and returned to Enterprises to ensure the final completion of the first of the 100-car bullet freight trains.

Things were going so well at The Construction Company that Tom had time to take Bashalli and Sandy on a dinner date and a movie. With Bud concentrating on running TBM #2 deep under the state of Nevada, it fell to him to make sure they both had a good time.

Sandy, while sad at first and feeling like the proverbial fifth wheel, soon began having fun.

Tom told them of the harrowing event finding the cavern. "The only good thing is, it is absolutely beautiful and I'm certain conquering it will help us in case we hit another one."

His description of the massive crystals was fascinating, but what really got their attention was when he mentioned, "When we

shone our high-powered light straight down, it bounced and reflected all the way to the bottom causing some trapped moisture in the air to light up like a thousand rainbows.”

“Can we go see it?” Sandy asked.

“Only if there is time left before the freight trains need to start running,” Tom told them. “But, if there is time I promise that you will get a chance to see one of the most beautiful sights in the world!”

CHAPTER 18 /

UNEASY PARTNERSHIP

TOM SPENT most of his days the following week working on the “Runway Project” as he called it. He spent more than fifty hours giving himself an immersion course in asphalt and road laying, then he spent two more days studying the FAA’s manual and specifications on runways and certification processes.

After six non-stop days he felt drained. After eight, he was on the verge of exhaustion. It was only on the orders of Doc Simpson—called by Chow when he discovered the young inventor slumped at his desk one lunch hour—that Tom finally let Bud, fresh back from his stint in the tunnel, drive him home where he immediately climbed into bed and had a twenty hour sleep.

He awoke stiff but refreshed.

By the time he got showered and downstairs, it was nearing lunch the day after he came home. Sandy was making soup and sandwiches for them.

“Where’s Mom?” Tom inquired and he hungrily eyes the deviled ham sandwich Sandy was currently making.

“She got a call from some friend this morning and headed out. Said she’d be back for dinner, and to not wake you up. Hope my cooking didn’t rouse you,” she said, noticing the hunger pangs practically etched on his face. “You sit down and I’ll dish you up some of my mushroom and split pea soup, okay? Oh, and deviled ham or egg salad?”

Tom could feel his mouth begin to water. “Both, please. Uh—split pea *with* mushrooms?”

“I was going to make both since I know how much you love mushrooms, but I wanted split pea, and we didn’t have enough chicken broth to do both. Mom told me once that she never uses water in soups, so I thought I’d best make the most of what we have. Therefore, a combo soup.”

As Tom wolfed down his first bowl and a ham sandwich, he barely acknowledged his sister’s presence. However, as he started on the second sandwich he looked up and her and said, “Thanks, Sis. The soup’s a little unorthodox, but it’s good. Where did you learn to cook? I’m pretty sure Bud thinks that you can’t boil water.”

Sandy stood looming over her big brother with hands on hips.

“Thomas Swift. Don’t you dare let on to Bud about this. I’ll tell him I’m getting to be a good cook when I actually *am* one. Until then, he knows nada! Understand?”

Tom felt it was time to change the subject. “You remember when I told you and Bash about the underground cavern?”

“Do I ever!”

“Well, I need to take a break for another day or so, and I thought—”

“That you’d take us both out to California to see the cavern? Oh, Tomonomo,” she said springing forward and hugging him so tightly around the neck that he started to choke. Releasing him, she said, “We can be ready to go first thing in the morning.”

“And, you’re certain that Bash will be available?” Tom inquired suspecting that something was going on.

“As soon as she heard that you had come home and were unconscious, we made plans to grab you and take you on an all-day picnic tomorrow anyway. It’ll be Saturday after all. This way, I get to fly and we all get to see your amazing cavern!”

The three met up at Enterprises the following morning. Bashalli came straight from work where she had opened her brother’s coffee shop at 6:00 a.m. They climbed into the *Sky Queen* and she excused herself and went back to the lounge where she fell asleep almost before takeoff. They were soon roaring westward stopping in Denver to pick up some supplies the California crew needed.

The time difference meant that they arrived at the California tunnel entrance just a couple of hours after they left Shopton—by the clock—so they would have plenty of time to take one of the rail racers in, spend a half hour or so at the cavern, and then come back in time to race back to Shopton for dinner.

The first “ooh” and “ahh” experience came when the girls saw the sleek, little vehicle that would streak into the tunnel and take them to their destination.

The second one was once the little car got up to a traveling speed of 100 MPH.

“It’s like racing forward while standing still, Tom.” Bashalli commented.

But, the big moment of awe came right after Tom stopped the car a hundred feet from the cavern, and they walked forward to the opening of the tunnel.

“You girls ready?” Tom asked.

“Oh, yes.”

“Please!”

“Here goes.” With that, Tom pressed the On button on the light controller. Everything around them exploded in colors and zig-zagging light shows. Bashalli was so overcome for a moment that she needed to steady herself by clinging onto Tom.

“Pretty impressive, huh?” he asked them.

Both girls were speechless. Later, Tom would tell his mother that they looked just like little kids in a huge candy shop. Everywhere they looked was something even more wondrous than the item before.

Finally, Bashalli wrapped her arms around Tom’s neck and hugged him. There were tears streaming down her cheeks that made his face wet. He didn’t mind.

In a voice almost too small to hear, she said, “I have never been a religious person, but this is as near to something only a god might make as I have ever seen. I do not know what to say. I do not think I have the words...” her voice tailed off.

Sandy sat down on the bridge and looked up. The lights could not penetrate all the way to the top, but the view was the most impressive thing she had ever seen.

“Tom?”

“Yeah, San.”

“Can you build a little indentation on a ledge right next to this bridge?”

“I suppose so. Why?” he asked.

“Because this is where I want to be buried when that day comes. I can’t imagine any place more beautiful.”

When the time came for them to drive back, both girls pleaded for “just another five minutes.” Tom had spent so much time and effort bridging the unexpected cavern all those weeks ago that he really hadn’t stopped to enjoy its beauty. He was happy to grant them the five minutes... and then another five when the first proved to be “far too little time.”

As they were driving back out—they had to reverse out because there was no rotating jack available and the three of them could not hope to lift the vehicle—Sandy sat behind Tom and Bashalli with one hand on her brother’s shoulder. About half way back she squeezed it.

“What’s on your mind, Sis?”

“Well, you know how I got a job and everything?”

“Yes.”

“And, I haven’t told you or Mother or Daddy where it is?”

“Yes, and I know that it makes Mom a little uncomfortable.”

“I know. That’s why I told her where I’m working three days after I started. I knew that she would make a big squawk about it if she didn’t know.”

“How about Dad? Does he know?” Tom asked.

“No. Just Mother. Anyway, after what you’ve shown us I owe you something, so I’ll let you in on it. Only promise you won’t tell Bud... at least not just yet.”

“I promise.” Tom was now very curious.

“Enterprises,” she stated.

“What? Enterprises? Our Swift Enterprises?” Tom was completely shocked.

“Yep. I marched right in with the want ad for the position I got and interviewed and made certain that the manager didn’t treat me any differently than someone right off the street.”

Tom didn’t say anything. He knew to let Sandy take her time. However, after a two-minute wait, he ventured, “What department?”

“Marketing and Communications,” she replied. “I’m working as a proofreader and press release editor for George Dilling. Starting as close to the bottom as possible, but he says I might be able to work my way up to coffee girl and waste basket emptier with time and good connections.”

“George has been keeping this from Dad and me? Impossible. I had lunch with him just last week... or the week before. Whatever. He never said a thing!”

“Sandra made him promise not to tell, and she swore me to secrecy as well. I am sorry if you are angry with me,” Bashalli said. Tom looked at her and could see the beginnings of a single tear in her right eye.

“Nah. I’m not mad at anyone. Just really surprised. Actually, Sandy, I’m truly happy for you. Dad made me start by running errands for him when I was eleven. It was a couple years before he trusted me with any real responsibility. You know? I’m proud of you.”

Sandy hugged him and kissed the tip of his ear. She whispered,

“Thanks, big brother. You’re the greatest!”

“As for you, Bash. I only hope that any other secrets you ever kept from me will be as pleasant as this!”

Bashalli leaned over and kissed Tom on the cheek. “I swear,” she promised.

By the time he returned to his lab on Monday morning, Tom felt completely rejuvenated. The trip and the awe-inspiring cavern experience had recharged his emotional and physical batteries.

As he sat down to work on his design, his phone rang. It was Munford Trent.

“I have a call I’d like to transfer down to you, Tom. It’s your old—um—friend, Ben Dumbarton. He says that it is urgent and that he would consider it a favor if you could take his call.”

“Okay. Send it to line two, please.”

When the phone rang again a few seconds later, Tom picked it up, saying, “Hello, Mr. Dumbarton. Tom here. What can I do for you?”

“Uh, Swift? I know that we’ve had our differences, but I need to ask that you put any resentment you might have for me behind. I need your help.”

“Mr. Dumbarton. I promise you that I hold no resentment for you or for what has gone on before. We’ve both been the victims of Miss Bjorgman’s attempts to ruin this project. I assume that you have been made familiar with the results of the FBI investigation?”

“Yeah. Sure. She’s in hiding. Too bad, too. I’d like to get my hands around her neck right now. Anyway, as I said, I’m in a heap of a mess and I really need to ask, maybe even beg, for your help.”

He outlined his troubles. The first part mostly centered around a problem his crews were trying to overcome when dealing with a lengthy stretch of basalt rock that had to be carefully excavated in order to complete one of the last stretches of rail bed his company was responsible for.

“We just can’t get through it fast enough. Whenever we blast an area out, the rock just crumbles in from the sides before we can get the rubble out and any sort of shoring in. Got any ideas?”

Tom thought for a minute before his eyes strayed over to the computer screen. It hit him.

“Mr. Dumbarton? I’ve been working on something that might help you. Unfortunately, it will take about two weeks to get my

device built and tested. That would only give you a week to excavate and another week to lay tracks. What distance are we talking about?”

He could hear the other man rustling through some papers. “That stretch of about ten miles. We’re going at less than a snail’s pace.”

“What about the other problem?” Tom asked.

“We’ve run into a stretch of about fifty-seven miles that have too many hills. I can blast those, but it is more than double the work of anything on the flat and I just can’t get enough men on the job to finish both of those areas.”

“So, what *can* you do?”

Dumbarton paused before answering. “To be honest, I can only see us doing the ten-mile stretch given the timeframe you mentioned for your new equipment. I guess I’m sunk. I really hate to call the DOT and explain how I screwed up—”

“I’d wait on that. I’ll make you a deal. You and your men help my Nebraska team get the tracks from the Mississippi Valley tunnel laid out to meet up with your ten-mile section—I think that’s about thirty miles—make sure that all of your road crossing points are complete and tested, and I’ll take on your longer stretch.”

“Uh, what about your new machine?”

Tom responded, “You get all the other stuff done and I’ll have the machines delivered right to the location you provide me. I’ll give your men the basic rundown on operation, but it will be up to you and them to finish your last ten miles.”

“Okay.” Dumbarton said with some hesitation in his voice. “What’s in it for you?”

Tom was completely taken aback by the question. “Well, Mr. Dumbarton,” he began, “that appears to be another place where we disagree on things. I never said that I wanted or needed anything out of this deal. Of course, I’ll expect you to let the DOT know that we will be, shall we say, working in close cooperation to finish the rail line, but nothing else.”

Dumbarton let out a long sigh. “I don’t understand people like you, but I’m man enough to admit when I need help. I’ll take you up on it. I should be able to give you the exact geographic start and finish locations in the next day or so.”

Tom called Hank Sterling next. “I’ve got a real quickie for you, Hank. Don’t bother to come over. I’ll be at your office in five

minutes. See if Arv can join us. I need both of you on this.”

Tom scooped up several pages of drawings and made sure that his CAD computer had uploaded the latest drawings and diagrams, then left his lab.

“This,” he told his pattern maker and model maker as he spread out his pages, “is supposed to be part of a new machine I’m designing to help us tear out the old runway asphalt and then lay down a new one. However, all I need from you and your teams are two good working prototypes, full size, of just the front end mounted on self-propelled treads.”

The two men leaned over the drawings and looked them over.

“Great big knobby, roly thing hanging in the front, huh?” Hank muttered. “What’s that for?”

“That is the fifteen-foot wide, six-foot diameter, solid steel encased in Durastress roller that will spin at about two hundred RPM and will rip up any and all rocks and other surfaces it hits.”

He explained that the two machines he needed would be used to rip apart the basalt rock that the Dumbarton construction team was having so much difficulty with.

“It will pulverize the rocks, crush them into manageable chunks in the smaller rollers behind, and toss them out the back where they can be scooped up. They’re having a problem with stability of the left over rock from their blasting. This will just eat a nice, wide swath through things and give them a fairly clean, straight surface to line with their quick-dry concrete.

“Two hundred RPM?” was all Arv had to ask. “Will that be fast enough?”

“If you can make it stable and running at three hundred or even faster using either a turbine or one of the Y-8 engines, go for it. Assuming that it won’t go wobbly and tear itself apart, the faster the better!”

“What about those smaller knobs on the sides of the roller, Tom?” Arv asked.

“I’m hoping that they can grind a smoother surface on the sides so the Dumbarton team can get right to pouring the concrete sides.”

Three days later Tom was called to The Barn to see how the units were taking shape.

Between them and their respective teams, Hank and Arv had already managed to fashion the steel drums and create several flexible outer sheaths complete with hundreds of grinding knobs.

This was already mounted in a heavy framework that, in turn, sported twin treads for moving the units.

“We’re waiting for a custom transmission for the Y-8 engines, Tom,” Arv told him. Should have that by tomorrow. That’s Friday. Give us the weekend to get everything connected and we can give you a demo on Monday.”

“Wow. That’s almost a week earlier than I expected. You are amazing!”

When he arrived at Enterprises on Monday, Tom drove straight to The Barn. There, as they had promised, were two monstrosities looking capable of tearing apart mountains.

For their demonstration, Hank had ordered a load of old concrete wall material that had once been part of the perimeter of Enterprises. It had been torn down a year ago to allow for a special end-of-runway lighting system to be installed.

The pile was over fifteen feet tall and easily thirty feet wide as well as deep.

Hank stepped up into the shielded operator’s booth at one side and started up the engine. Moments later he engaged the high-torque transmission and the giant cylinder began spinning. First, slowly and then with ever increasing speed until Tom could no longer discern the individual knobs. With a smile and a thumb’s up, Hank engaged the treads and the unit crept forward.

As it hit the first pieces, all Tom and Arv could hear was the thunderous pounding and the shriek of shattering concrete and torn rebar. Massive amounts of dust flew out the back of the unit along with the pulverized concrete.

When Hank finally backed away and shut the machine off two minutes later, they could all see a fifteen foot wide, ten foot deep gap in the pile in front of the machine, and a pile of rubble, no piece larger than a baseball, sitting behind it.

“Wish I’d thought to bring ear plugs,” Tom yelled at Arv.

“Nine twenty three,” Arv yelled back, looking at his watch, then grinning at having made the old joke.

Hank joined them. “Well? What do you think, skipper?”

“I think that we need to do a little more testing and then get these out to the Dumbarton site. Great job!”

Tom put in calls to each of the five site managers of the Swift tunnels. “I need to have at least one TBM available in the next five days to do some pick-up work,” he told each one. “What can you give me?”

Only one of the TBMs would be finished enough ahead of schedule that it could be broken down and transported to the Dumbarton site. Tom made sure that the entire crew would be ready just as soon as it could be backed out of its tunnel. Slim Davis, currently acting as manager for the tunnel being completed by TBM #4, promised to have the huge machine backed out and ready for pick up by the *Super Queen* eight days later.

“It’s going to be tight, Tom, but we can pick up a full day if Gopher Three can run their tunnel an extra fifteen hundred feet. Maybe even a couple thousand.”

Tom agreed and called to let the crew of the TBM destined to connect with Slim’s tunnel that they would be needed for an extra day or two of work.

“If Slim needs to pull out even two days early, skipper, we have enough supplies to finish even a full mile of extra tunnel. Just say the word.”

Tom felt a rush of pride over the spirit of cooperation and work attitude his employees—and friends—had displayed throughout the lengthy project.

“Say, Tom. What ever happened to your idea to set things up for a north-south line?” Bud asked later that day.

“I’ve been thinking about that, Bud,” Tom told him. “The optimum location is right in the middle of where Dumbarton and his men are digging that last ten-mile stretch. I’d suggest it to him, but Dad and I feel that it would just be better to tear out a little bit of his work at a later date. I was in favor of asking Mr. Dumbarton to go ahead and do it, but it would take far too much explanation—not worth the hassle for the eventual outcome. Although, doing it on good faith might even have set his company up for another contract.”

Bud nodded his agreement.

“It’s too bad Ben Dumbarton can’t or won’t understand that,” he told Bud.

“Don’t let it get to you, Tom,” Bud counseled his best friend. “Some people are just too bull-headed for their own good!”

CHAPTER 19 /

THE FIRST MEETING

ONE FULL DAY ahead of schedule, the longest of the tunnels, the one running under the Rocky Mountains, was completed. The TBM heading east stopped and pulled back when there was just five feet of rock to dig through.

The crewman operating it at the appointed time backed the machine up almost five hundred feet and shut everything down except the bright lights at the digging head.

Tom, Bud, Damon Swift and more than a dozen railroad and DOT dignitaries wiggled their way through the access hatches and stood in front of the massive machine waiting for the holes to be connected.

Tom had driven a special rod through the wall using a pneumatic hammer. The rod would provide feedback to the oncoming TBM as to how much further they had to go.

As previously arranged, once it was determined that the two TBMs were within one hundred feet of each other, progress was slowed to under a half foot a minute.

Tom checked the readouts on the computer he was using to register the alignment of the tunnels.

“How close, Son?” his father whispered out of the side of his mouth.

“Looks like two millimeters of horizontal offset and about a half that in the vertical. Well within the tolerances we wanted,” Tom whispered back.

Mr. Swift went back to the guests and let them know about the progress and when they should be seeing the hole in front of them appear.

A crew was finishing erecting a clear, flexible Tomasite curtain to the tunnel to protect all of them from the enormous heat that would be unleashed as the last of the dirt and rock vaporized. They finished and moved their ladders to the side.

Then, almost without warning, the wall in front of them began to crumble and vaporize. The giant digging head of the approaching TBM shut down and there was an abrupt silence.

In awe, the group of people stood, unmoving, just looking. It took a full minute before Jonas Markham cleared his throat and

softly muttered, “Well, I’ll be... it’s... it’s just... words fail me.” He turned to face Tom. “You can’t imagine how this makes me feel, Tom.”

Tom grinned, then looked down at his readouts. Motioning to the crew to take down the temporary partition he addressed the group.

“Ladies and gentlemen, in a minute I invite you to join me in shaking the hands of the crew of TBM number two.”

The celebration lasted for almost an hour before the visitors climbed back through the head of Gopher One and drove off in three of the little rail racer cars.

Bud clapped Tom on the shoulder as they stood watching the last car departing. “I’ve got to hand it to you, Tom. Of everything you’ve done down here on Earth, this has to be about the most impressive. At least on the biggest scale!”

“Thanks, but now the last of the hard work begins. Now we have to get that Gopher and my two rock crunchers out to put the Dumbarton areas back on track.”

Everything back at Enterprises had gone very well. All testing of the spinning drum rock diggers had been completed with better than expected results.

Tom and Bud flew them out to the site of the Dumbarton dig.

Ben Dumbarton greeted them with a friendly smile, but Bud could sense that his employees were not pleased to have anyone from Enterprises at their location. He caught one man sneering at him then quickly turning away when Bud turned to face him.

“Your men don’t seem overly happy to see us,” Tom remarked.

“Well, I did warn you a while back that they might not play nicey-nice with your men. Once they get a little resentment in the back of their minds, it takes more than a little to knock it out. Shouldn’t be any real trouble.”

Tom, Bud and the Enterprise crew that had accompanied them in the *Sky Queen* rolled the two machines out of the hangar compartment and down the ramp.

Any anger was momentarily forgotten at the sight of the machines. Dumbarton’s men crowded around to get a good look at these new pieces of heavy equipment.

After Tom had the chance to check them out, he declared them ready for demonstration. Ben motioned to the six-foot-deep trench fifty feet away. “That’s as far as we’ve been able to get. I sure hope your machines can do the trick.”

Tom asked Bud to make certain that all the men had earplugs, handing pairs of them out to three or four who did not. Then, Tom stepped up into the operator's platform, started up the powerful engine and sent the machine forward and down a ramp that the construction crew had prepared. Once he reached the bottom he aligned the machine with one side of the trench—it would be necessary to run the two machines side-by-side to create the proper width trench—he set the huge front drum spinning.

A moment later he inched the digger forward and the knobs on the drum bit into the rock. Just as with the first test at Enterprises, lots of dust and dirt and small rocks came flying out of the back, beginning to pile up as the digger moved ahead.

Within minutes, Tom had it forging ahead at the rate of greater than six feet per minute. Although capable of more than triple that, he wanted to keep the speed down until he knew how the basalt rock would react to the pounding and grinding it was being subjected to.

Shutting the machine down, Tom climbed down and returned to Ben Dumbarton and his men.

“Assuming you can run them at about eight feet per minute, and for at least twenty-two hours a day, your ten mile stretch should be completed in about seven days,” Tom told the assembled men as they admired the fairly smooth surfaced left by the machine.

Ben Dumbarton asked when they might get started. Tom replied that the training should take about fifteen minutes per man. With two machines and two instructors, he assured the burly construction manager that his crew of almost twenty men could be up to speed in less than three hours.

“Let's get started,” he concluded.

Most of the construction men immediately caught on to the procedures, but one man, the one Bud had spotted sneering and glaring at them, seemed eager to learn but unable to master the operation techniques. Finally, angry and frustrated the man tossed his work helmet to the ground, snarled at Bud, and stalked off.

“That's one of my trouble cases,” Dumbarton confided in Tom. “Frank Duncan. I've had to bail his butt out of jail twice on this project. Goes into town on his day off, takes on a snoot-full of beer, and picks a fight with anyone he thinks is looking at him wrong.”

“My suggestion is that you don't let him handle the machines. They require a steady hand and full attention, as you saw when

you operated one,” Tom told him.

The Enterprises crew packed up their tools and other belongings and headed back into the *Sky Queen*. The following day they would need to pack up more tools and leave in the *Super Queen* to pick up the “free” TBM so that it would be transported to the lengthier stretch of Dumbarton line that was now Swift Enterprises responsibility.

When the team departed, Tom and Bud left in a Toad for a tour of the fifty-plus-mile stretch. Overflying it, Tom could immediately see two reasons why the Dumbarton crew had fallen so far behind schedule.

For starters, they had strayed more than five degrees off course, and that had taken them away from the relatively smooth path that had been marked on their charts. This led to problem number two.

This new route had taken them right into a series of low hills, just high enough that the amount of excavation required had practically tripled for the Dumbarton team.

Tom set the jet down on a disused road near the point where he believed the route had gone off course.

“Wonder why?” Bud asked when Tom had explained the situation to him.

“Your guess is probably as good as mine, flyboy. I’m not going to ask questions, at least not right now. Instead I think we need to do an air survey to see what we need to do to get back on track.”

Bud grinned but abstained from commenting about Tom’s pun.

It required five flights on various courses before Tom hit on his plan of action. He swung the jet around and headed for a point twelve miles back from the end of the current track. Setting back down, this time in a nearby field, Tom and Bud dragged out a GPS marker post, dug a hole for it and pounded it into the ground.

Walking back, Tom reached into the cockpit and pressed a button, causing the marker stake to eject its load of bright orange dye onto the ground around it.

“That’s our new start point,” he told Bud.

They flew to the point, almost seventy miles away, where the next stretch of Dumbarton track had been laid. Checking his instruments and survey map, Tom determined that this point was only about thirty feet off the mark. It would be sufficient.

They dug in and activated another marker stake before

heading for Shopton.

“That will give us the exact start and end points. We’ll run the Gopher along the surface where we have no rise or fall in altitude, then let it dig in as far as it needs to in order to keep things as level as possible,” he told Bud as they departed the area.

“Are we going to have the time?” Bud inquired.

Nodding, Tom replied, “It will be cutting things close for Slim and his crew, but I’m certain they can make better than twice the speed above ground as below. I’d like to be here to try to find ways to make things go faster, but I’ve got to finish the first of the locomotives and overcome a few production problems. Full time work, I’m afraid.”

“Do you want me to work out here with Slim?”

“No. The sort of things that might make a little difference are well within his ability to come up with, or to act on if he asks for my help. Thanks, though!”

Two days later Tom received a call from Slim Davis.

“Skipper? We just touched down at the West end of the new dig. There’s a problem.”

Tom felt a momentary wave of panic wash over him. Taking a deep breath, he asked, “What?”

Slim explained that the marker had been removed. “The signal was gone when we got near the GPS coordinates you gave me. There’s just a hint of the dye visible. Obviously, someone took the thing and tried to scuff out the marker dye.”

“What about the other end of the line?” Tom asked.

“I’m flying back that way now, skipper. Never thought to check it on our way past. We’ll be there in about a minute. Hold on—”

Tom was trying to figure out what might be going on when Slim’s voice came back on.

“Well, the marker dye is here, but the signal is a couple miles away.”

“What?” Tom practically yelled into the microphone.

“And, it’s moving!”

“Follow it, Slim. Find out who has that marker. Buzz them as close as you dare then order them to drop it. I’ll contact the local sheriff’s office.”

When Tom had finished his call, Slim was waiting for him.

“We seem to have more of a problem than I anticipated, Tom. We have the man who stole the marker. It’s one of Dumbarton’s men!”

An entire series of swear words flashed through Tom’s mind before he finally said, “I hope you have him in custody, Slim.”

The pilot stated that they did.

“Good. When the deputy gets there, have him arrested and charged with grand larceny, theft of Government property, and industrial espionage. That ought to hold him. Who is it, by the way?”

“His driver’s license says Frank Duncan. That mean anything to you?”

Tom told him that it did and ended the call. Next, he placed a call to the head of Dumbarton Construction. When Ben Dumbarton came on the line Tom launched into him.

“Any idea where your employee, Frank Duncan is? Any idea what he’s been doing? Do you know who gave him the idea or orders to interfere with the work we are doing to bail your corporate butt out of the flames?”

There was a moment of silence on the line, and then Ben Dumbarton spoke.

“Swift? I haven’t seen Frank Duncan since last night. He took one of my pickups and headed who knows where. I’ve called the Sheriff and reported the thing as stolen.” The man sighed. “Tell me what he did.”

Tom told him about the markers. He was angry enough that he also told the man about the mistake his crew had made and how it had forced them far off course.

Dumbarton was dumbstruck. He muttered an apology, then, in a heavy and resigned voice, told Tom, “I’ll get on to the DOT and take full responsibility. I hired him so he’s my responsibility.”

Taking another tack, Tom asked, “Are you positive that you had no knowledge of what Duncan planned to do?”

“It’s like I told you and told you. My men are the sort who hold grudges. I guess Duncan is mad because he missed out on a special union skill bonus for learning a new piece of heavy equipment. Would have only meant another two bucks an hour, but he was kinda hot about that when I told him he didn’t make the cut.”

Tom was unsure where to take the conversation. The only thing he could think to ask next was in regard to the mistakes

made in following the surveyed route.

Ben Dumbarton admitted that he had taken a week off at about the point where the construction team veered off of the proper route. “I only noticed it the other day when I walked to the top of a hill and could see an old building to the south that we were supposed to demolish and run right through. It was a couple miles away. I knew we had troubles right then and there.”

Tom refrained from pressing the man why he hadn’t notified Enterprises of the goof. After all, Tom had already agreed to take of that stretch of excavation and rail laying.

He hung up a minutes later, only slightly mollified that Ben probably *was* telling the truth; at least his version of the truth!

Slim Davis and his crew had their Gopher in place—the GPS marker had been replaced the day after Frank Duncan had stolen and destroyed it—now back on schedule and had started forward. The corrected route meant that their TBM would be able to run straight and level, encountering only about a dozen small hills along the way. Those, he had noted, would not require the complete submersion of the Gopher into the earth. At the most, they would be digging only three-quarters of the available height of the machine.

He was glad that Tom had thought to make the tunnel lining portion of the machine adaptable enough to allow him to open and close the various nozzle dispensing the foam whenever necessary.

There were other obstacles to surmount including more than fifty country roads, private lanes and highways.

Fortunately, Dumbarton felt so miserable about the recent mistakes and sabotage that he brought on a special crew to install all crossing guards and equipment.

That left a single, small river to go over. Again, the Dumbarton organization had prepared for this and had a portable bridge ready and waiting for the *Super Queen* to pick up once it was required. The fifty-foot span went over the riverbed, dry now as it typically was nine months out of the year.

A phone call from the Department of Transportation took Tom by surprise. “Tom. It’s Jonas Markham. I just wanted to let you know that the President has authorized a three-week extension to the project deadline. He has been informed that one of the contractors, Mid-West Construction, is behind schedule. This is a vital project, so he is giving you all a one-time break. Hope you can put it to good use.”

Tom agreed and thanked him for the information.

The next week Tom spent almost all of his time away from Enterprises going over every inch of track and tunnel built by Swift Enterprises along with traversing the tracks place by the other contractors. He outfitted one of the rail racers with a set of laser measurement devices, capable of detecting variations in the track alignment as slight as five microns.

All in all, after six days of crossing the country in the little vehicle, he detected only a single point where tracks laid by one of Dumbarton's crews—less than one thousand feet in total—fell outside of the strict tolerances mandated by high-speed rail travel.

He opted not to notify Ben Dumbarton but to have an Enterprises crew come out with the necessary equipment to nudge one track closer to the other by about fifteen millimeters.

Exhausted, he returned to Shopton late one evening. Arriving at home, he was pleased to see Bashalli over visiting Sandy.

"Heyhow'sitgoingBash?" he slurred as he gave her a weary hug.

"Oh, dear," Bashalli said, stepping back and looking at him with concern crossing her beautiful face. "You must go to bed right this instant, Thomas. Now."

He grinned at her, nodded, and trudged upstairs. He tumbled onto his bed and was asleep in seconds.

Back downstairs, Sandy remarked to her friend, "That's probably one of the few times a beautiful girl will suggest bed to a boy, and he'll agree and go there all alone."

They both laughed.

A night's sleep did wonders and Tom was back at work by eight the next morning.

He glanced at the calendar on the wall. "Just twelve days to go!"

CHAPTER 20 /

BICOASTAL RUN

“HOW FAR in is machine Five right now?” Tom was deep inside of the tunnel running between upstate Ohio and the New York terminal inspecting the final cable and electrical installations a week later.

Hank checked his computer console. It showed the current locations of all five of the machines. “Almost directly under the four-fifths point, skipper. Looks like they’ve got about thirty miles to connect up with the above ground rails.”

Tom was elated. That news meant the entire stretch between the West Coast and the end of the Rockies tunnel would be completed in just another seven days.

“How’re they doing on the vertical shafts?” he asked.

“Nothing showing here. Want me to call them?” Hank asked.

“No, Hank. I’ll walk back out a way and call them myself.” Tom picked up his portable computer and tunnel phone and headed away from Hank and his crew. He stopped several hundred feet back and eased himself into one of the side vents. Although only slightly noisy outside in the tunnel, he preferred the relative quiet of the alcove.

Attaching his phone to a data cable, he dialed out to the digger being operated by a crew currently being managed by Bud. “Hey, flyboy. What’s your status with the vent shafts?”

“Good news and bad news, skipper,” the flier told him. “We’ve been sending up the Shrews every five miles recently, but seem to have lost three of them. Slim shipped me two of his, so I still have three onboard. We’ve still got a signal from the three up there, but no indication they are moving, and we can’t get them to come back down.”

“Where did you lose them?” Tom asked.

Bud told him that the missing three were from thirty, twenty and fifteen miles back along their route. “All I can think of is that they must have hit an air pocket. I’ll be sending out a crew later tonight to try for recovery. The last one has been just fine, by the way.”

Tom thanked him and asked that he be informed immediately if Bud’s cavern theory proved to be true. “If so, and if they are all in one large continuous chamber, we may be able to make a

single, larger exit from the topside down and let the chamber absorb some of the pressure difference.” He signed off and returned to the digger.

An hour later, on schedule, Bud halted the forward digging long enough to bore a starter hole above his Gopher and to send up another shaft drone. In minutes it had disappeared upward and the vapors from the built-in smelter came back out of the shaft and into the collection container. Only a slight tell-take smell indicated that the blaster was still working.

“Just a couple more, Tom, and we’ll be near the exit point,” he said when Tom checked in several hours later.

“Got everything you need?”

Bud answered, “We could use some more tunnel foam. Had a bad batch last time and my tank’s running on empty. The good news is that our team got up into the big cavern about sixty feet above the tunnel roof and found the missing Shrews. They got them sent back down. No damage. Now that I need to send up the Spews, I really need that foam!”

“I’ve got to check on the other teams and make sure we’re getting all of the VBMs back, but I’ll check on your mixing crew. You should have a foam resupply in another three hours or so.”

“I’m heading back out now,” Tom told Hank when he walked back up the tunnel. “Keep up the great work. It looks like you’ll have all of the cabling finished in the next day or so. With that, Tom climbed into the little rail racer. Revving up the engine he shot back and away from Hank’s crew. An hour later he reached the tunnel exit.

A quick check with all crews, including the Dumbarton Construction teams working to finish lining the sides of their last surface run, showed that most of the work was on schedule.

Ben Dumbarton personally came to the phone to tell Tom the good news.

“I have to hand it to you, Swift,” he said. “We wouldn’t have been able to get this done without you or your amazing crusher machines. Working like a charm,” he told Tom.

“What about your trans-Nebraska team finishing up between your new trench and the piece we’re doing? I hear that there may be a problem.”

Dumbarton hemmed and hawed, but finally stated, “They’re running into all sorts of troubles, Tom. It’s all the dratted road crossings plus one Amtrak spur line that they still use once a week. We never knew about that until yesterday!”

Tom smiled ruefully remembering how his suggestions of running totally underground had been ignored.

“Are you digging the crossroads under your tracks or running straight through with signal equipment?” he inquired.

Dumbarton explained that they had begun digging under nine major roads so they would pass under the tracks, but that both excavation and drainage problems had been popping up faster than they could handle them.

“I’ve got seven more roads and a highway to go under. I can handle the small ones with crossings. The bottom line is that we are going to need every second of this three-week extension.”

“Let me get back to you in about a half hour,” Tom requested and cut the connection. He placed another call, back to Shopton, and spoke with his father.

“You do what’s best, Tom. Remember. It’s the entire project that must be a success, not just the Swift Enterprises portions.”

Tom made a few other calls to his various crews. He was elated with the overall news he received. He placed another call to Ben Dumbarton.

“Okay. Here’s what I can do for you... actually, for all of us,” he explained. “I’m making another one of those grinding machines like you are using. Get the other two grinders to work, and part of your crew prepared to operate the third one to dig roads under the existing tracks. I’ll have an Enterprises crew work side-by-side with them to pour the actual road surface and retaining walls and create the bracing to hold up the tracks. We’ll work on the drainage problem after we get the first train running across the country. Got that?”

“When do you want my team?”

“Right now for your two grinders. Three days for the new unit. I’ll fly it to your first site then. Get me the exact GPS locations of each and every road we need to go under. Only well-traveled roads. The rest you will need to install guard signals on. As far as the Amtrak rails, I’m going to make a call to Secretary Markham and see what he says.”

The gruff construction man agreed to get Tom the location information immediately.

“Good,” Tom told him. “Your team must be ready for an immediate start when the digger gets there.”

I really need to take a break, Tom thought after hanging up. *I* was just about ready to scream at the man’s incompetence. As

Bud would say... Jetz!

He made a quick call to the DOT, telling the Secretary's administrator about the Amtrak rail issue and getting her promise of an answer by the following morning. He thanked her, climbed into his rental car and headed to the airport. En route he contacted Arv Hanson and told him about the need for a third grinder.

"Your dad had us knock one out just in case. He figured that we might as well. He told me he could think of at least one other use for it in case you don't need it. I'll have it there tomorrow if you like."

"No," Tom told him. "Just one day early will do."

Three hours later he was picked up by Sandy, piloting an SE-11. They sped back to Shopton where Tom's first stop was his bed. A full night's sleep made him feel better as did the delicious breakfast prepared by his mother.

At Enterprises he met with his father and brought him up to speed on everything happening.

"Do you believe that all of the tracks will be finished in," Damon Swift looked at the wall calendar, "two weeks and a day?"

"As long as we don't run into any more caverns like the one in Nevada I have complete faith in the schedule," Tom told him. "Oh, thanks for the extra grinder."

His father just smiled at him and nodded. "By the way, Jonas Markham called before you got in. He told me that Amtrak is abandoning that spur line in five months, so we just need to put in some sort of cross-track and a warning light three miles on each side. They'll be responsible for maintaining safe crossings until then."

"That's great, Dad. Just about makes my day. Thanks!"

He left moments later to drive to the Construction Company. There, Tom inspected the progress on the first four engines.

"It's a good thing that the government decided to only request four trains by the extended start date," Jake Arturian said as he walked up behind Tom. Tom shook the man's hand and commended him on the work being accomplished.

"When do we need to deliver the others?" he asked.

"Two every two months, but we'll have them ready in three months total."

They went into the next building where the last of the

individual transport cars for the first train were being completed. Tom walked along the assembly line looking at the progress being made with each successive car. From bare trucks all the way to the final cars, only the final fifteen were all but complete.

“We are a little bit ahead of schedule,” Jake informed him. “The only pieces we’re still having to put some extra work into are the coupling and drive cars that go between the front and rear engines and all the cars in between.”

When Tom inquired why this was, Jake motioned him over to a computer terminal. “See this spec for the engines,” he asked pointing to one schematic. Tom nodded. “Then take a look at the approved specs for the coupling cars.” He brought up a side-by-side view of both.

Tom immediately saw the problem. “The coupling car is two inches too narrow,” he exclaimed. “That will cause too much drag. How did this get past us?”

Jake shrugged. “Not sure, but both pieces had to go through the DOT approval. They’re the ones that specified the size. On the positive side, it doesn’t affect the insides or the drive trucks, just means we need to mold new bodies.”

Tom was suddenly filled with anger. He was almost certain he knew what had happened and who was behind it. He excused himself and headed back to his office at Enterprises. There, he told his father of his theory.

Mr. Swift smacked his fist into his other palm. “Damn and blast! Trent?” He had pressed the intercom button.

“Yes, Mister Swift?”

“Get the Secretary of Transportation on the phone. If he’s in a meeting, have them pull him out. If he’s in the shower, have someone toss him a towel. I need to speak with him *right now!*”

It took almost five minutes for the Secretary to come on the line. “I really hope this is important, Damon,” he said. “I was yanked out of a meeting with the Senate Highways Committee and they are none too pleased.”

Damon filled him in on the discovery and of Tom’s theory.

Flabbergasted, he replied, “Bjorgman? You think she tampered with the approvals? Why, that miserable—” He couldn’t get the last out. “Back in a minute,” he said placing them on hold.

Three minutes later he came back. “The problems was exactly where you believed. I found your originals, plus a different set she sent to CanPacLant with the approval seal. She must have sent

those same ones back to you. Since you are required to work off of the approved plans, well—”

“Any idea why she did it?”

“Oh, yeah. A real humdinger of an idea why. I found out something from the FBI just this morning. It seems that her father is Floyd Farmer. Name ring a bell?”

Neither Tom not Damon could place it.

“Then, I’ll tell you. Floyd Farmer is the CEO and part owner of Illinois Locomotive. The ones who lost out on the bid to you for the engines. Daddy’s little girl was doing everything she could to undermine your bid at first, and then she did that whole poisoning the water stuff between the four remaining companies, capped off with this tampering with your plans. I’m not sure how deep this goes. It might include Farmer himself. Are we in trouble now? Can we still make the schedule or does the President need to announce another date change?”

“Mr. Secretary,” Damon said, “the track part of the project is on schedule. The locomotives, at least the first batch are just about ready. The majority of the freight cars have been delivered to the staging facility and are awaiting shipment, and everything except the coupling cars seems to be fine at this end.”

“I just want to make certain we don’t end up with egg on our faces.” In the end, it was agreed the current extension of three weeks would be sufficient for Enterprises. The Secretary promised to get back to them once he had checked with the other contractors.

Tom told his father he couldn’t understand how someone could be like the Bjorgman woman.

“Be honest. Wouldn’t you be tempted to do something if it would help Enterprises?”

“No, Dad,” Tom told him point blank. “Of course, I’d do everything up front to get a contract, but if we lost one fair and square, then I’d have to shrug it off and move on.”

“I’m glad to hear that, Tom, but we have an advantage in all this. We can move on to many other things. Her father’s company only builds locomotives. They have nothing to move on to.”

During the following two weeks all the Swift tunnels and tracks were completed. Only the last of the road underpasses being dug—along with Dumbarton—and the final approvals for the two shorter above ground routes between the western tunnels that were the responsibility of Mid-West Industries, were left to be completed.

Tom and Bud flew out to California in the *Sky Queen*. They landed near the transportation terminal that was nearing completion. After a brief status update—the Swift’s set of tunnels all the way to the East side of the Rockies were complete and ready for trains—they climbed into the blue-striped rail racer.

“We’re going to take it all the way to the end of the tunnels and then pick some instruments. Then we continue on to at least the end of the next leg. We’ll fly home and have someone take the racer back later.”

Minutes later they went racing off toward the East. As they entered the first tunnel in the Sierra Nevada Mountains both boys felt the immediate increase in pressure. Soon, however, their ears adjusted and they were ripping down the tracks at almost one hundred miles per hour.

“Open her up, Tom,” Bud suggested, thankful that the little, low-slung vehicle was fully enclosed and mostly soundproof. “Top speed!”

“I don’t dare, Bud.” Tom explained that the system override would kick in suddenly once it detected that the racer was nearing any point where the tracks transferred to those of another builder or going into and out of tunnels. “Until we can certify that Mid-West’s rails are up to standards, the limiter stays on. Later, these can run at full speed. As long as we stay under one-hundred-thirty, we’re fine.”

They continued through the tunnel until they found themselves coming to the underground cavern. Tom slowed down and switched on the cavern lighting system by remote control. They stopped in the middle of the bridge.

Bud was in awe of the beautiful mineral deposits and the streak of gold running along one wall. “It’s amazing, Tom,” he whispered. “Jetz!”

Tom, too, was taken in by the amazing sight. “I suggest that you take a quick look down before we head out.”

Bud climbed out of the car and walked to the side. He looked down over the railing, and his eyes went even wider. “Geez. It goes down practically forever!”

Tom told him that it was a trick of the light as he climbed back in. “Actually, it only goes down another thousand feet or so. Still —”

He sent a signal and turned off the cavern lights and they sped away down the tunnel.

Two hours later they reached the first exit point and slowed

down to under fifty so that Tom would observe both the steel tracks and roadbed laid down by another contractor as well as to check instruments and laser-measurement devices to ensure the accuracy of the tracks. They picked up speed as they entered another of the tunnels and then slowed to repeat the track checks on the final leg before the Rockies tunnel.

Prior to reaching the tunnel Tom stopped the car. "We camp here for the night. Tomorrow it's your turn," he told his friend.

"What's the next stop?" Bud asked the next morning as he started up the small racer's engine.

"I believe that we'll go on through Colorado and a little of Kansas. When we get near Nebraska we'll have to stop. That's where Dumbarton goofed up and we're pulling his feet out of the fire. Our team is still aligning and mating the rails there. I think it's going to be about eleven hours from here."

They were thrilled with the performance of both the tracks and the rail racer. Tom allowed Bud to throttle up to one hundred eighty miles per hour for a while as they traversed the tunnel, but had him slow down as they exited and traveled through the eastern half of Colorado.

When they arrived at the Nebraska site of the new underpass below Route 83, Tom could see that work was going well. They climbed out of the racer and soon met up with Mel Flagler, the Enterprise captain of this site.

"What's up, guys," he asked as Tom and Bud shook hands with him.

"Just taking a little drive around and thought we'd check on you. Going well?" Tom asked.

"As long as I can keep that Dumbarton out of my hair, it's going fine. But he pokes his nose in at least five times a day to check on the status."

"Why isn't his team doing this dig?" Bud asked. "I thought all Enterprises was supposed to do was the road work and the overhead braces."

Mel nodded, a look of annoyance on his face. "They were, but he was having so many problems with finishing up the smaller digs that I agreed to take this one. Hope you don't mind, skipper?"

"No. As long as this keeps the entire project on time, this is the point where we just get it done. Good work!"

“It would go a lot quicker if Dumbarton stayed clear. I’ve lost a whole day so far.”

Tom promised to have a word with the man. “Thanks, skipper,” Mel told him.

“When do you get to pull the equipment out and get the road poured?”

“Day after tomorrow, Tom. Then it’s a day of wall work and the overhead, then we head for home!”

With the fixes being made to the size of the mid-train power cars, Tom knew that once this final piece of road work was finished, Swift Enterprises’ part of the rail project would be complete a full nine days before the extended due date. At least Enterprises wouldn’t need the full three-week extension.

Tom and Bud slowly drove the rail racer over the underpass on the existing tracks and then sped on to the town of McCook and the nearest airport.

As before, Sandy flew out in a Toad to pick them up. This time she brought along a friend.

Tom was really pleased to see Bashalli sitting in the copilot seat as the little jet taxied up to the small terminal building.

“Bashi flew us most the way. I got a chance to just relax for a change,” Sandy declared.

“I only sat there and tried to not do anything foolish,” Bashalli admitted.

“That’s what we call ‘flying’ in the pilot business,” Bud confided in her.

The foursome flew back to Shopton and to a celebratory dinner at the Swift’s. Over a roast beef dinner the conversation never strayed far from the rail project.

Tom and Bud described the amazing smoothness of the built-in rails. “Even where one company’s rails have to connect to the Swift rails, Tom’s system of adhering them together means that you never notice a thing except for a slight noise change when you go from the Durastress rails to the steel rails of the other companies.”

Tom added, “And that is visually noticeable because the color of the rail in front of you changes.”

Mr. Swift cleared his throat and everyone turned to him. “We had a bit of news today from Washington you might be interested in. That Bjorgman woman was captured as she attempted to fly

out of Montreal on a passport in her real name, Jessica Farmer. She is only one of two problems the DOT had. As you know, she turns out to be the daughter of Floyd Farmer and was trying to ruin our efforts.”

Everyone knew about this except Bashalli, but she assumed that it was not the time to ask questions.

Damon continued. “It seems her brother also worked at the DOT in the documentation department. It was he who tampered with our original design diagrams, making the change that meant we were building the connecting cars too narrow. He is also the person who killed our employee, took his ID and sabotaged the SE-11 and your miniature test train, Tom.”

Tom was stunned.

“Both are now in federal custody and will be facing a variety of charges including murder, espionage and treason.”

“What about Floyd Farmer?” Tom asked.

“He was so distraught that he suffered a heart attack once he heard the original news of his daughter, and another, much more serious one when he found out about his son. The Bureau is pretty sure he knew nothing about any of this. He may not survive.”

Everyone was stunned at the news. They sat there for a moment digesting what they had heard. Finally, Mrs. Swift suggested that they go into the living room for dessert. “We shouldn’t let this ruin our celebration.”

Three days later, and right on schedule, Mel Flagler called Tom to report that his team was on the way home.

“I had to come down pretty hard on Dumbarton and his crew. They wanted to be right in here with us. I guess they want to be able to claim that they finished their section.”

Tom inquired whether Mel had been able to dissuade them.

“Too right, skipper,” he replied. “I promised him that we wouldn’t make a big thing about coming to their rescue so long as they backed out and backed off. But, I did promise to spread it around really thick to all the news agencies if they didn’t.”

“I’ll bet he wasn’t too happy,” Tom told him.

Indeed, Ben Dumbarton had been practically incandescent when Mel had ordered him out of the underpass site. He had cooled down considerably within the next two hours, enough to politely request a meeting with Mel. It had ended with

Dumbarton agreeing that his men would be in the way and would be best suited in double checking the above ground work they had completed.

* * * * *

On the scheduled day, everything appeared to be ready. Tom inspected the inaugural train that would run the east to west route from front to back and both sides. Satisfied that nothing was amiss he returned to the waiting crowd.

Both Tom and Ben Dumbarton made speeches. The CEOs of the other companies decided to remain in the background. Mr. Dumbarton praised Tom and Swift Enterprises and gave them full credit for all of the work they took on where his company, and others that had backed out of the project, had fallen woefully behind.

Tom mentioned how the American spirit of cooperation had seen them all through, even when the project looked doomed at times.

Then, the moment came. The team of railroad employees who would drive the train cross-country appeared to shouts and cheers. Each man, sporting a brand-new uniform with “BulleTrain” insignia—designed by Bashalli—shook hands with Tom, Damon, Ben Dumbarton and the Secretary of Transportation along with the other CEOs and dignitaries present.

The six-man team climbed into the engine along with Tom. He made one final check of the systems and then handed the chief engineer the coded key fob. He exited the train and stood holding hands with Bashalli.

“I am so very proud of you, Tom,” she told him quietly. “This is a momentous occasion. I hope you are also proud of your fine work.”

Tom squeezed her hand.

The running lights came on, the Y-8 engines started and the dynamos began spinning up. In minutes, the train began inching forward. Two minutes later, it was inside the tunnel and out of sight and approaching more than 50 MPH.

Tom flew the entire group of Government and railroad officials along with Ben Dumbarton and the other CEOs out to the terminal in California.

Right on schedule, just eighteen hours later, the train pulled into the terminal. The crew, looking happy and a little tired, came out to the cheering crowd.

A second set of shorter speeches were made, including the train driving team who gave it their highest praise.

Within the hour, practically everyone had left to attend a late dinner and champagne celebration. Only four people remained at the terminal.

Sandy and Bud walked over to where Tom and Bashalli were standing, still admiring the sleek engine. “So, brother dear. You already have your next big project picked out?”

Prophetically, Tom replied, “I figure to stay Earthbound and maybe do a little something out in the ocean. I need to get my feet wet, again. Either that, or head back up to the Moon to prospect for lunar gold.”

He couldn’t realize what soon lay in store for him in the depths of the oceans of the world.

“Hey, skipper? One thing came to my little mind the other day, and I forgot to ask you about it.”

“Shoot.” Tom told Bud.

“Well, you know how the tunnels are all open and trains can go in and out?”

“Sure...”

“What’s to keep things from wandering in and getting in the way of the trains?”

Tom grinned. “Still thinking about those goats?”

Bud nodded.

“Don’t worry, flyboy. We’ve set up sonic screens that will keep any of your goats out, and it’s loud enough to deter most humans.”

Bud and Sandy walked away, leaving Tom and Bash to wander around the station.

“Thomas?” Bashalli asked as the two walked hand-in-hand. “Will you promise to do something for me?”

“Sure, Bash. Name it!”

“The next time you head up to the Moon, will you take me with you?”

“The Moon, Bash? Heck,” he replied, grandly sweeping an arm out and then bringing it in and around her shoulders, “I’ll take you all the way to *the stars!*”

Little could Tom realize that his next destination was as far from the stars as he might imagine!

