



**Tom Swift's —
I And The Egg**
(With apologies to Betty MacDonald)

By T. Edward Fox

When he was building his very first Jetmarine, Tom Swift also came up with a nifty undersea diving suit, nicknamed the “Fat Man” suits by good old Bud Barclay.

Much more than just something that popped into existence, these suits were and are marvels of the art of invention and how it can meet needs not even anticipated.

This is the story of how Tom, Arv Hanson and Hank Sterling came up with these golden gems of the ocean.

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This story is dedicated to me. That's right... me. I had a dream more than twenty years ago in which I started a company that created just this vehicle and helped save the lives of five astronauts at the ISS. I'm not bragging, I'm just telling you. In my dream I was a variation of Tom Swift. Maybe what I'm trying to say is that we all have a little Tom in us. In our dreams, we create amazing things. Too bad most of them never get built!

A SWIFT ENTERPRISES INVENTION BONUS

I And The Egg

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FOREWORD

The title of this short story is obviously taken from the famous book, *The Egg and I*, which is a horrible example of poor grammar. It should have been *The Egg and Me*. Of course, pointing that out is rather churlish of me. Or, at the very least, it is another fine case of the pot calling the kettle, “Black.”

As my mother’s pots all featured a shiny copper bottom, I never understood that one until later in life.

But, enough about me.

Let’s talk about Tom Swift and another of his enduring inventions, the Fat Man diving suit. Much like the Jetmarine itself, this offshoot invention appeared in many of Tom’s adventures. And, why not?

It is both simplicity itself as well as being useful in the highest order. But, as with most “that looks kinda simple” inventions, there is a whole lot more that went into it. Enough that the Fat Man might even have been worthy of its own novel and not just sprung on all of us as that thing that sits in or near the airlock of the Jetmarine.

It is a true marvel of its time. As with most good things, it was eventually surpassed, but it stood its ground for many, many years.

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Victor Appleton II

PART 1**I'm Building This Little Sub**

TOM SWIFT was toiling over a small circuit board, wisps of smoke curling up from his hot soldering iron and the smell of the melting tin and flux prevailing in the air.

Behind him on a tall stool perched a dark-haired teen. Bud Barclay was Tom's best friend, fellow adventurer, and one of the fine group of young pilots employed by Swift Enterprises. He had been sitting there for almost an hour, quietly watching his blond-haired friend work on the latest of more than fifty small controller boards he was intending to build.

Straightening up and stretching his arms and back, Tom pulled off the safety glasses he had been wearing and rubbed his nose.

"Taking a break, skipper?" Bud asked him.

Bud's voice startled him. He had honestly forgotten about him being there, so intent was Tom on his task.

"Gee. Sorry, Bud. I got a little tunnel-visioned on this." He gave his friend a lopsided grin. "How long have I been ignoring you?"

"Including today, just over two years," Bud kidded Tom. The two had met when they were both just turning sixteen and had hit it off immediately. Within days they were not only the best of friends, but Bud was accepted as almost a member of the Swift family.

Especially by Tom's younger sister, Sandy. She had taken one look at the husky, athletic teen and declared—to herself—that this was the boy/man she was going to marry.

They began dating a few days after she turned sixteen.

"I've been trying to find just the right set of circuits and controls to use in the new type of diving suit I'm creating. You know I've got that sleek new little submarine almost ready to build."

Bud nodded. He had been involved in some of the design of the small atomic-powered submarine that Tom was thinking of calling a mini-marine, short for miniature submarine. As Bud understood it, the atomic pile not only generated the electricity for everything inside the sub, it also produced enormous amounts of heat that would be used to vaporize sea water which, in turn, would shoot out of small jets located about the hull providing propulsion and steering.

"Sure," he replied. "And these circuits are for that, huh?"

"Actually, no. These are going into a pair of special diving suits that will be standard issue in the sub. All self-contained—assuming I can work all of the bugs out—and capable of acting as their own super-miniature submarines."

"Why not just make those, then," Bud asked. "I mean, if they're all self-contained..."

"Only to a degree, Bud," the inventor told him. "Besides,

I'm not making them aqua-dynamic. They're actually kind of ponderous to tell you the truth. I just want them to be able to operate for an extended period outside of the sub. Mostly in case of emergencies."

Bud asked what the suits were going to look like.

"I haven't come up with the final design. Big enough for someone to stand in and rigid so it won't be fitting like a wet suit. These will have to be really rigid to withstand the pressures down where I want to go. Anyway," he said absently as he pondered something, "I'm working with Hank and Arv on the outside design. Right now I know most of the systems I need to control and that's what all this is about." He swept a hand out to point at the jumble of boards, circuits, resistors and the like that covered most of his workbench.

Bud just grinned and shook his head. He knew that Tom would get it all figured out. The best Bud could hope for was to be asked to help test whatever came out of Tom's mind.

"Have a good night, skipper," he told Tom. "I'm heading home."

Tom glanced at the clock on the wall opposite his bench. It said 7:52. "Oh," he said. "I should be heading home too."

The following morning Tom called his chief model maker, Arv Hanson, and his number one pattern maker, Hank Sterling, to his office and lab located in the underground hangar at Enterprises.

Five minutes later both men walked past the berthed *Sky Queen*—Tom's giant triple-decker jet aircraft—and into Tom's office.

"What's up, Tom?" Hank asked.

Tom pointed at the mish-mash of electronics on his bench. "We need to get the design for the diving suit finished so I can finalize the controls."

Hank pulled his sketchpad from the satchel over his shoulder and set it down on the bench. Opening the cover he flipped back several pages until he found the page he wanted. After folding everything back behind, he laid it down.

"I've been trying to find a form that fits the function. As you can see," he pointed at several small sketches that had been crossed out, "I've come up with more things that I don't think will work than ones that I believe in."

Tom looked over a pair of designs on the second row of pictures. Pointing at the left one, he asked, "Why not this one? I thought that it was our winner. It's what I believe will work best for the small submarine. Flexible yet durable enough to not collapse under pressure. Great for stowing away. What happened?"

Hank shook his head. "There's just no way to manufacture all those hinged panels, skipper. I've tried fifteen variations of it and can't come up with any way to make a pattern that can work. We could make a pair of the suits for you and Bud, but what about someone like me? Or Arv. Or, even Chow? I'm three inches taller and a Tom-sized suit wouldn't fit; Arv is three inches shorter.

Ditto the fit issue, and I don't even want to go there as far as Chow's belly is concerned!"

The threesome laughed at the thought of the rotund Texas chef. At just five-feet ten-inches tall, Chow was about fifty inches around.

"Okay. I give up on the interlocking panel approach. So," he pointed at the second illustration, "why not the tube approach?"

The second drawing looked more like a flattened torpedo with a drive system at the back and a clear nose. The occupant would lay down inside and be able to steer it by use of a joystick, plus use a small pair of flexible mechanical arms and gripper hands by placing their own hands into a pair of controller sensors.

"Some of the same problems with size plus one big issue. We don't have a propulsion system and power solution for something that relatively small. Give me a small atomic pile or some sort of super battery, and then come up with a way to push it along, with everything fitting into a space about the size of two basketballs, and I can build the shell and all the other components." He shrugged.

Tom nodded. "Some day?"

"Absolutely. And, something like that could zip through the oceans at maybe eighty or even ninety knots!"

Arv had been quiet, but he now spoke up. "Hank and I have been talking about this a lot, Tom." Arv was the man responsible for making the many miniatures of both

Tom's and his father's inventions, he also made the scale test models.

"We looked and looked over the list of all the things you want to do and came up with just one design that meets all your requirements and can be easily built. Also, it will fit just about anyone from about five feet even up to a six foot nine person. Even Chow could wriggle into the thing."

Tom was intrigued, and his face showed it. "Well, don't keep this young man in suspense, guys! What is this perfect design?"

Hank turned his pad to the next page.

Tom stared at the gleaming, golden design.

He stared at the smooth, rounded surfaces.

Finally, he stared at the two men in his office.

"Uh, I was thinking along the lines of sleek, easily stowed and powerful," he thought about what his friend, Bud, known for attaching long lasting and often pun-based nicknames on Tom's inventions, would make of this one, "and you guys are telling me I should really be thinking about... uh... *Humpty Dumpty*?"

PART 2**Inhale... Exhale... Uh?**

THEY TALKED about the many features and functions that went into coming to the current design idea. Tom decided to open his mind and to listen to all of their reasons. He asked dozens of questions about many of the aspects of the new diving suit.

Slowly, he came around. In fact, within less than an hour he was looking at the large, egg-shaped suit design with a new found appreciation.

“If I have this right,” he tried to summarize, “the shape not only lets us go to depths even farther down than I had thought about, the size gives up enough room for everything we need to truly turn these into exploration suits as well as survival and rescue suits. Gee. Now the thing is I will need to figure a way to add these to the little sub.”

Arv spoke up. “I’ve had an idea about that, Tom. Why not build these right into the side of the sub? Make them the airlock, so to speak. You open the view pane/hatch and climb in from inside the sub, then close over a sealed inner hatch and just back out and away. The inner hatch keeps the sub water tight while the deep suit is detached.”

“And,” Hank added, “when it comes back, the back side of the thing becomes the outer skin of the sub.”

Tom had to give that one some thought. He knew that the strength of any inner hatch would need to be

extremely high to keep the ocean from flooding in and crushing everything inside the sub, even at depths as shallow as a few hundred feet. And, his intention was to take the little sub several thousand feet deep.

“Now I have to come up with a power source for these,” Tom told them. “And, a propulsion system.”

He thanked the men for their work. After they departed, Tom called over to his father’s office. Getting their secretary he asked to speak with the older inventor.

“Certainly, Tom. Just a moment.”

As he waited, Tom thought over several possibilities and the questions he wanted to discuss with his father.

“Hello, Tom. What can I do for you,” his father answered when he had picked up the receiver.

“Do you have an hour or so for me, Dad? I need some advice and someone to bounce a few things off of. It’s about my little submarine project.”

“Come on over.”

When Tom arrived at the spacious office he sometimes shared with his father, he nodded at the older man—someone who might pass for an older brother rather than a father—and sat down.

After describing the new egg-shaped suits, he asked, “So, what would you suggest I look into for power? Obviously we can’t run any sort of combustion engine to generate electricity, and the current state of battery technology would only give us an hour of power at best. I

need something that can last hours and hours. Even a day or more!”

Mr. Swift pondered the question for a minute or so before he spoke. “I’d suggest looking into seawater batteries, Son. They store forever drained and can be filled and activated in a couple seconds. All you need to do is take a little of the power they produce for a circulation pump to keep fresh seawater moving through it.”

Tom got a big smile on his face. “I’ve heard of those. Like the ones used on life preservers on ocean liners. Right?” His father nodded. “Can they produce enough power?”

“Well, you might need to tinker with them, but I’ve seen demonstrations of batteries about the size of a automobile battery, and weighing about one-quarter the weight, that feature up to eighteen individual cells, each producing about one point five volts for a total of twenty-four volts, that can run for at least a full day before the plates inside degrade.”

“What’s inside?”

“Oh, the ones I’ve seen are proprietary, but from what I’ve read some have silver chloride and others magnesium and silver chloride. You’ll have to research them beyond that. You said you had a question about propulsion as well?”

Tom nodded. “I’ll need to come up with something that is better than a series of small props all around the suit.”

His father nodded and looked upward, stroking his

chin, a sure sign he was thinking deeply about something. Finally, he looked at Tom and told him, “You might want to look into using a compressed air system. Something that can drive a small but powerful hydraulic system to sort of squirt out pressurized water.”

“Use the materials that surrounds the suit?” Tom asked.

His father nodded.

Over the following two weeks Tom spend about half his time finalizing certain aspects of his mini-sub and the other half devoted to his new diving sit.

Hank called him one Thursday and invited Tom to view the first prototype of the main body.

“The set of five arms you designed was going to be too ungainly, skipper,” Hank told him. “We reduced them to just two, but instead of being on rigid mounts with a single joint, we made this first one with fully pantographic arms. And legs. Any small motion you make is amplified and exactly scaled up—or down if you want to do fine detail work—by the computer on board. Each arm effectively has a shoulder, elbow and wrist as well as the three fingers and opposable thumb at the end.”

“And, the legs?”

“For those few times you might want to walk, and I’m seriously thinking that won’t be very often, you operate them by placing your feet into a set of stirrups and pretend to walk by swinging your legs. I did a test with a mock-up of a system where you stand inside, but the motion is just too clumsy. I kept falling over even with the

gyroscopic assist.”

He opened the round, clear tomasite view pane and pointed to the single person bench seat inside. “You sit there—I’m thinking about adding some sort of restraining harness—and operate everything.”

Tom looked the thing over and then climbed inside. This model was currently hanging from several cables as the test legs were not powerful enough on dry land to hold up the suit’s weight, even empty. He sat down and slipped his hands into the glove-like hand-arm controllers and his feet into the stirrups.

After moving the arms around and swinging the legs for a few minutes, he poked his head out and asked Hank about the power and propulsion systems.

“As soon as you have them developed I’ll make the adjustments to fit them in. I’m hoping that the lower quarter of the egg will be large enough for everything. Oh, and skipper?”

“Yes?”

“Arv pointed out a couple of missing items yesterday. There’s no way to carry enough compressed air or even pure oxygen to last more than a couple hours. Even at that, the CO₂ will build up pretty quickly. We’ll need some sort of scrubber.”

Tom smiled. “Got both of those for you, Hank.” He explained that a small device, powered by its own seawater battery, would use its electrical output to power a set of electrodes that would break down additional

seawater into hydrogen, oxygen, and all of the minerals and impurities from the water.

“I’m developing what I call a hydrogen power cell that will process the hydrogen by passing it through a fine mesh of platinum. The byproduct will be additional electricity as well as water vapor. As far as cleaning out the air, I’ve adapted a system from an old deep sea experiment the Government funded a few years back. They used a fan to draw the air through filters of lithium hydroxide. The carbon sticks like glue and the clean air passes back into the cabin.”

Hank looked like he was about to ask a question. Tom tried to anticipate it. “You’re about to ask how long the filters last. Right?” Hank nodded. “About four hours. I figure that if we outfit these with one already in the system and a set of six more under the seat, that will give us a full day plus one extra just in case.”

I shouldn’t be amazed at Tom’s ability to figure these thing out, Hank told himself. He smiled. “Great! Now all we have to do is figure out the propulsion system.”

In days Tom delivered a working prototype of a hydraulic piston system that fired in and out at an amazing rate. A valve opened when the plunger was pulled out and water was drawn in. When the piston was reversed, another valve at the other end allowed the pressurized water to be ejected at a high rate of speed. Several nozzles and intakes would be set around the top, bottom and the back of the suit, all controlled from inside.

The following week Tom called Bud. “Hey, flyboy. Come on over to the pressure tank. I want to try out a new

undersea suit and want your input.”

When Bud arrived, the first thing he did was let his jaw gape open. A moment later he closed his mouth and just stared at the strange device.

Tom climbed inside, closed the hatch and then radioed the hoist operator to lift the suit up and place it into the tank. As the suit was clearing the ground, Bud took the mic and called out to Tom, “You and the Fat Man have a nice swim, skipper.”

Everyone could see and hear Tom groan and they realized that Bud had just dubbed the suits. “I was certain you’d call this a Humpty Dumpty.”

“That would be stupid, skipper. There’s already a Humpty Dumpty an he cracked apart.”

The test went well but Tom emerged with a fairly large mental list of changes.

“For starters, I’d like to get rid of the small hatch. It’s kind of Jules Verne and just doesn’t give me enough visibility. It was like sitting three feet inside of a metal tube and trying to see what’s around you. Let’s use that new quartz-tomasite composite for a top-side hatch. It can be formed and cured into a solid piece. I guess I’d only like the top fifth or so made of that. It will also make it easier to climb in and out of.”

Other changes included the ability to extend and retract both the arms and the legs. “I’d like them to be telescopic and have indentations in the shell to fit into to make the whole thing a little more aqua-dynamic. I can see that

having the arms and legs flailing around would be a hindrance.”

As a final task to take on himself, Tom agreed to design a buoyancy system that would allow the user to rise or descend at will. He knew that varying depths would require more or less buoyancy. In the end, he came up with what he described to Bud as an electronic sponge.

“It will be a honeycomb of micro-fibrous copper. If I pulse a positive and then an alternating negative charge into it, I can draw in and expel the water. Seawater has a slight positive charge as it is. This will just use that to our advantage.”

Tom also mentioned that he needed to perform a few tests on the tomasite shell material. “There’s something nagging at the back of my brain,” he told his father that evening. “Even under just forty feet thought I could feel it compressing a little. It made my ears plug up.”

For a couple weeks Tom worked closely with Hank and Arv developing each and every component that would go into the first working suit. The most important being the hard shell surrounding the lone occupant. It needed to be light enough to be moved by one man—easy enough given the ultra-light materials available both from Enterprises and from outside vendors—yet it needed to be stronger than titanium to withstand the extreme pressures it would be subject to at depths. It was something that his tomasite was not up to accomplishing.

Although adept at metallurgy, Tom decided to call in an expert. In this case it was an entire company. Pittsburgh Metallurgical was world renown for their work in

strengthening steel. They provided a team of seven scientists to work with Tom at Enterprises. All they asked in return was the commercial rights to produce anything that came from the joint venture.

Tom and his father had readily agreed as neither one wished to get Enterprises involved in the hot and dangerous business of smelting metals on a large scale.

Richard Chalmers, the lead metallurgist, sat down with Tom three days after his team arrived.

“One of the things we have noticed is that your people really are into promoting your tomasite plastic, Mr. Swift,” he told Tom. “And, while it has some wonderful characteristics, we firmly believe that it belongs on the inside of a metal shell, and not make up the entire shell.”

He showed Tom several printouts detailing strengths and shattering points of various materials.

“But, sir, it looks like tomasite has no problems withstanding the pressures. Your own data indicates that it will not shatter, even at a theoretical depth of over eight thousand feet.”

The man nodded. “Correct, but only as far as raw data shows us. In truth, at a depth of about five hundred feet your tomasite remains strong, but it is not rigid. It bends. Puckers in, if you will, to the point where the internal pressure of your capsule would soon triple, finally moving in so severely at three thousand feet that your oceanaut would be physically crushed by the air pressure!”

Tom thought a moment before responding to this

horrific news. “What about molding in a series of ribs to strengthen the shell?”

Now, it was Dr. Chalmers’ turn to ponder. He pulled out a small calculator and was soon entering complex equations and truncated numbers. He finished two minutes later and turned the face of the calculator to face Tom.

He looked at the final figures. His shoulders sagged. “I see,” he admitted. “That seems to indicate that it could be done with extensive cross bracing, but we would lose the necessary room for the man. Correct?”

Dr. Chalmers nodded. “There is one good thing to come from this, however. At the thinness needed, none of our current materials would perform at such depths. But—” his look brightened, “—we believe that a new alloy for an outer skin along with your tomasite as an inner layer will be more than sufficient!”

“What sort of alloy?” Bud asked as he entered Tom’s office. He had waited outside for a few minutes, listening, but decided that he wanted to know more.

“Ah, it is Mr. Barclay, correct?” The doctor asked.

“Yes, sir. I heard a bit of the conversation. Especially that part about being crushed. I, for one, would like to avoid that. So, what is this alloy?”

“Well are you familiar with the strength characteristic of titanium?”

Bud nodded. There had been many times when Tom had thought about using that precious metal for the outer

skin of the submarine. Fortunately, the skin of the sub could be thick enough that Tomasite was more than the perfect material.

“Alright. Then, what can you tell me about magnesium?”

“Uh... I remember in high school the teacher took a small piece out of a vacuum package. When it was taken out and dropped onto the counter, it practically exploded.”

“Right. But, we have been tinkering with it as an additive to other metals. It adds strength and rigidity. Particularly to titanium,” he said looking knowingly at Tom.

“What sort of amounts, sir,” Tom asked.

“Be prepared to be surprised, my young friend. Almost sixteen percent magnesium to about seventy-nine percent titanium with some small amounts of aluminum, copper and gold. In the end, the gold does its work during the smelting heat then migrates to the outer planes turning the metal sheets or bars an orange-gold color. Makes it completely anti-corrosive.”

An additional three weeks of experiments and fine tuning of the formula went by before Dr. Chalmers and his team were as satisfied as Tom was with the new alloy dubbed megnetanium.

They departed with the promise to have several large sheets of the metal forged and delivered to Enterprises within the next two weeks. “You will need to heat it back

to around five hundred degrees for the cutting and shaping, but once it gets back under two hundred it will hold that shape and be just as solid and as strong as before.”

While waiting for the new material to be delivered, Tom set about completing the computer programming along with working to construct the first moveable arms and legs for the prototype.

A week of furious work saw the first Fat Man suit complete and loaded on board the *Sky Queen*. Bud’s nickname had stuck.

Tom piloted the giant jet to a point one hundred miles off the coast of Florida to an area known for its blue and very clear water and depths generally in the one to two thousand foot range. An ample test depth for this first go around.

Leaving Slim Davis in charge of keeping the jet hovering over one spot, Tom and Bud went back to the large hangar where the Fat Man suit had been stowed along with a hoist to lower and raise it.

Tom climbed in and swung the tomaquartz upper hatch closed. Locks clicked into place and the suit’s arms and legs soon began to move to Tom’s directions. He gave Bud a thumbs up sign.

A minute later he watched as the water rose up and over the top of the suit. He could feel it bobbing in the light waves.

Using the arms he quickly detached the hoist’s straps

and floated free. Radioing Bud he said, “Everything is looking good. I’m going to head down about fifty feet. Look for me to bob back up in about three minutes”

With that, he pressed a sequence into the control panel and the suit began a slow descent. Tom was able to swivel his head around and could see all around him. He brought up the arms in front of him and flexed the ‘fingers.’ Everything was working well. He was even able to turn the suit around by using the legs to ‘swim” around.

Without warning, Tom’s suit froze. He could move neither arms nor legs. Frantically he searched through the circuitry behind the small control panel for anything that might be causing his predicament. He was so absorbed in his search that he failed to notice that the Fat Man suit was beginning to drift downward, and at an increasing rate.

It wasn’t until the pressure relief valve opened and he heard the rush of air that he looked up into the now inky darkness enveloping him.

Keying his sonaphone, he called out, “Tom to Bud. I’m in trouble here. Do you read?”

He waited a few seconds and repeated his message. Time after time for more than five minutes he tried to gain contact with Bud.

Or, anyone.

PART 3

Down Below and Back Again

THE NEXT thing Tom realized was that it was becoming very dark outside. Looking up he could still see the brightness of the sky above, but that too was diminishing as he sank farther and farther.

Two minutes later there was a thump and his inertia pushed him deeply into his seat. He had reached the bottom.

At least I’m not going any farther down, he told himself. *But, now what?*

He still had ample electrical charge in the batteries. The instruments—which still were working—showed a one hundred percent charge. That meant he would continue to have breathable air, at least for one full day.

Tom tried the sonaphone again. “Tom to Bud. Mayday! Tom to Bud. I repeat. Mayday!”

He stopped to listen. Nothing.

It had been almost five minutes beyond the time he had told Bud to expect him to resurface. *Bud must be initiating a search by now,* he told himself.

With nothing better to do, Tom pulled out one of his ever-present screwdrivers and removed the main control panel cover. The opposite end was a small flashlight. He could see nothing that looked out of place or damaged. Returning the cover to its place, he eased himself up from his seat and pulled it up and forward.

It swiveled toward the ‘front’ of the Fat Man and bumped against the wall. A magnetic strip held it in place.

He was practically upside down when Bud’s first call startled him.

“Tom! It’s Bud. Where are you? What happened?”

He struggled to get upright, pulled the seat back into position and reached for the sonaphone.

“Tom to Bud. I’ve had a malfunction. I’m trying to figure it out, but I’m stuck down at—” he glanced at the depth gauge indicator, “—eighteen hundred feet.”

There was a long pause, and Tom was about to repeat his call when Bud came back on.

“We copy, Tom. I was asking Slim if we have enough cable to get down to you. Negative. Can you hold out until we get back? Probably two hours?”

Rechecking his instruments and taking a deep breath to check the air, Tom called back, “Okay. But, head for Key West and Kane’s communications station. Radio ahead and he’ll have whatever you need there. It should cut out an hour.”

As a second thought he added, “Can you drop a buoy to mark my location. Hate to have you get back to the wrong spot.”

Tom could imagine Bud grinning at that. “Already done, skipper. Buoy and dye marker. Be back before you can miss us.”

Tom returned to his upside-down position checking out everything in the lower portion of the egg. He was about to give up when he spotted a small stream of water jetting

in from a point around the left leg joint. Needle-thin, it was shooting across and right into one of the computer cases. This, Tom considered, should not be the cause of his troubles. That case should be waterproof.

What dismayed him was the sight of the growing puddle of water in the very bottom of the egg. It already was at least five inches deep in the middle. He did the mental math and figured that if the fifteen minutes he had been underwater had allowed that much water in, he would still be okay in an hour.

But, some of the equipment, such as his air scrubber system—that needed to be low in the shell since CO₂ sinks—would be submerged in less than another thirty minutes. Once that happened, he had about ten minutes of breathable air.

That was going to be a problem.

Tom considered trying to move the leg around to see if one position might tighten the seal, but gave that idea up when he realized that it could make the problem worse.

He returned to an upright position and looked through his pocket and then through the small toolkit located to one side of his seat.

He found three sticks of gum in his pants pocket along with a penny and a small notebook. In his shirt pocket he carried his screwdriver set, small radio and a soldering iron, all disguised as mechanical pencils.

The toolkit provided various other materials, most designed to repair wiring issues, replacement fuses, and a cleaning cloth to wipe away condensation from the view dome.

An idea hit him.

Taking out a pair of needle nose pliers and some solder from the kit, he pulled out his pocket trove of goodies. Then, he pulled up the seat.

The water jet had not gotten any larger, but the water was a full inch higher and now just two inches below the leak. He climbed down, standing in the icy water, and squatted as best he could.

He used the pliers to twist and shape the penny. Soon, it was bent so that it could seal the hole, assuming that Tom could adhere it.

“Good thing this test model doesn’t have the inside tomasite shell,” he said aloud. “I couldn’t solder to that, but I can to the gold in the metal shell.”

Seconds later he had the soldering pencil heated up, the penny held into place, and the small spiral of solder held in his now chattering teeth.

The water had made his feet numb by now and his body was beginning to shake. But, with a determination born of necessity and oncoming panic, he managed to get the penny stuck to the gold layer in one small place. Now that he could let go of the pliers, they dropped into the water. He quickly soldered around three quarters of the penny. He wanted to do more but the incoming water prevented the copper of the coin from heating up enough to stick to the solder.

He was about to give up when it hit him. Pressure. Internal pressure. If he could raise the internal pressure to a point high enough that it equaled the outside pressure, he could stop the inflow of water. But, he

realized, that pressure at his current depth could crush him.

He decided to see if he could minimize the water flow enough to get more of the coin soldered in place.

Thanking his father for insisting that an emergency oxygen tank be installed, Tom pulled his feet from the water. He couldn’t feel them. He opened the tank’s valve and could hear the contents hissing out and into the egg. Soon, his ears needed to pop as the internal pressure rose.

This happened five more times before he began seeing a difference in the amount of water coming into the egg. By the time the tank was empty, the pressure hurt, but he could move. Barely. Only now, the blood coming back into his feet made them throb and hurt.

Nothing to do about that, he told himself.

Reaching back down, he managed to get the gap of unsoldered penny reduced by fifty percent. He was about to give up when he heard the sonaphone call.

“Skipper? It’s Bud and Slim. You still down there?”

Painfully, he pulled himself back up and into the seat. It was a struggle to reach out for the microphone, but he finally grabbed it.

“Here, flyboy. A little bit of pain right now. Been under some pressure.” He knew Bud wouldn’t understand the irony of that statement, but it was out before he could stop it.

“We’re sending down a sling and a light. Once you see it give us some directions and we’ll move it over to you.”

“Better get the portable decompression chamber

warmed up,” Tom told him in a weak voice. He briefly explained about having released the oxygen into the egg without allowing the pressure to equalize.

Three minutes later, Tom believed he could detect the light in the cable. It looked like it was coming down a few hundred yards away.

Through gritted teeth he provided directions. Knowing that help was so near he decided to release some of the pressure. But, he knew that he could cause himself to suffer from the bends if he released too much, too quickly.

It took almost fifteen minutes to get the sling rig near enough. Because the arms and legs were still non-functional, he had to direct Bud and Slim into a position where it would slip under one arm and then the other. It took six tries, but he was finally being raised, slowly, toward the surface.

The combination of the pressure and the stress and a lack of sleep during the final week of preparation for this test finally all dropped on Tom like a ton of bricks. Just before the top of the egg broke through the surface, he passed into blackness.

Bud carefully lowered a second loop of steel cable down and snagged one of the legs of the Fat Man. Using that and the existing sling, he managed to pull Tom and the suit on board the first try.

Seeing the unconscious form inside, Bud hit the intercom button in the hangar and yelled out, “Hit it, Slim! You know what’s, to the walls. Tom needs medical help!”

The giant jet lurched forward and Bud had to grab onto the Fat Man and to one of the anchor points in the floor to keep them both from being swept out the still-opened hangar doors.

An automatic system designed to close the doors in case they were forgotten took over and soon the hangar was sealed and warm air was being vented in.

Slim set course for Fearing Island, the Swift’s island off of the coast of Georgia, and called Enterprises to have Doc Simpson meet them there.

Bud looked through the view dome and saw that the pressure inside the egg was still more than four times normal. He opened the outer vent valve and listened as the air inside escaped. It took ten minutes to do it safely. After that, he picked up his friend’s limp body and carried him to the second level and into the pressure tank. Setting it for ‘4 Atmospheres,’ a guess based on what Tom might have been able to increase the pressure to, he looked through the view port at his friend.

Bud had covered Tom with thick blankets. In minutes he could see Tom’s body begin to shiver. He hoped that was a good sign.

Soon, they reached Fearing and a team of medical personnel offloaded Tom inside of the decompression chamber and transported him to the small infirmary on the base.

Doc Simpson arrived just five minutes behind them and hurried to Tom’s side.

The inventor had just regained consciousness. Doc directed him to attach a series of input sensors to various

parts of his body. Soon, the news was good.

“It looks like he’s going to be okay,” Doc told Bud, Slim and the assembled staff.

The following day, Tom was able to walk to the *Sky Queen* and was returned to Shopton.

Three days later he was tearing the Fat Man suit apart, trying to discover what had caused the problem. With nothing obvious, he resorted to studying the computer records which automatically recorded everything.

Except, they didn’t. In fact, Tom believed they stopped recording just about one second after the suit failed.

But, it was what *was* recorded just before that point that made him smile. Just at the time when the seawater batteries came to full power, there had been an electrical surge. That, Tom believed, had killed all major circuits and had frozen the suit.

Five days later, and with the addition of a special circuit that allowed power to only slowly come up, Tom tried out the suit a second time.

The leak had been repaired. It occurred, he discovered, when the power surge made the arms and legs spasm, the seal had ruptured around just the one leg. All seals were replaced with slightly stronger ones.

The test was a complete success. Tom was able to descend—at a controlled rate—back to the sea floor in the vicinity of where he had his recent troubles. The suit was able to jet back and forth above the floor, walk, albeit awkwardly, along and even do a mechanized version of the breast stroke.

After a complete check over back at Enterprises, he declared the suit ready to manufacture. Two of the suits were put into production immediately, and were on the way to being completed just in time to become standard equipment onboard Tom’s small submarine a few weeks later.

By the time the little submarine was ready for its first test in the open sea, Tom, Hank and Arv had not only created two fully-functional suits, but they had made a discovery.

Once mounted inside the sub, which Tom had decided to call the Jetmarine—for jet propelled submarine—it was discovered that there was so little extra space that the tops only cleared the overhead wiring by a few millimeters.

“Well,” he remarked to Bud as they toured the Jetmarine prior to setting sail, “until either you or I gain a few pounds we can still climb up and into these. After that, I’ll have to figure something else out.”