THE AERIAL PIPELINE

At the north end of my Southwestern Michigan farm there are several hundred mature sugar maple trees, a remnant of the virgin beech-maple forest that once covered the area. The trees are clustered in and around a ravine that is about thirty feet deep and two hundred fifty or more feet wide and through which flows a small stream. While the ravine undoubtedly saved the trees from the pioneer farmers who cleared the forests in the mid-nineteenth century, it posed a problem to my late twentieth century efforts to become an amateur syrup maker. By far the most of the maples, if not the best, are located on the far side of the ravine, across from my little sugarhouse. It would not be feasible to carry the fifty gallons of sap needed to make each gallon of syrup down into the ravine, over Rick's Creek, and back up the other side to the sugarhouse at Pointe George. (One of the pleasures of owning a bit of country property is the privilege of naming its topographical features.)

I considered and rejected several solutions to the problem. One was to make some kind of tank wagon to hold the sap that I could pull behind my little Yanmar tractor or my Honda ATV. I worried about trying to pull a heavy wagon (fifty gallons of sap alone weighs over four hundred pounds) up the steep sides of the ravine along trail covered with snow or mud. Besides, it seemed an inefficient and inelegant solution to carry the sap down into the ravine and back up out of it again. It was for the latter reason that I also rejected the suggestion of a farmer friend to simply run a long hose down through the ravine and back up to the sugarhouse and pump the sap through with a gasoline-powered pump. It would be much more satisfying to build a pipeline that went from one side of the ravine to the other in a nice straight line. There are many trees in the ravine that grow higher than the sides, and

I studied them carefully to see how I could use them to hang a pipeline, but I couldn't figure out a way to do it without climbing up into the trees. I am much too old and cautious for tree-climbing on that scale.

It has been my experience that if I worry at a problem like this for long enough, I may one day wake up with an inspired solution. And so it happened in this case. Ever since I bought the farm, my brother Rick had been urging me to build bridges over the various little ravine streams. We had in fact built a nice little Buddha Bridge, a twenty foot drum bridge of Rick's own design (he is an ethnic Californian), over Rick's Creek just below the sugarhouse. But what Rick really wanted to do was build a suspension bridge. Though sympathetic to the idea, I couldn't find an appropriate place for one that we could handle. I wasn't about to attempt a two hundred fifty foot bridge across a ravine that I could fairly easily walk through.

But one day I happened to be thinking about the suspension bridge and the pipeline problem at the same time, and the solution to the problem was evident. The pipeline didn't have to hang from the trees; it could hang from a cable spanning the ravine, just like the roadway of a suspension bridge. The solution was both efficient and elegant, and I couldn't wait to begin.

I first broached the plan for the cable-suspended pipeline shortly after Rick arrived for the 1983 "sugaring" season. (He practices law in a small town in Northern California but manages to get back to the farm a couple of times a year.) We were in the kitchen of my house in Glencoe, and my wife Andrea was fixing us some breakfast before we left for the farm. He was definitely interested in the proposal. I explained further that I thought I had found the proper formula for measuring the curve of the hanging cable--a "catenary"--in my old college calculus book, and his pleasure was evident. Rick has the kind of enthusiasm for solving complicated backyard engineering problems that some people have for word puzzles or video games, whereas I often have little patience for details once the overall concept for a solution is produced. Rick and I work well together.

"But what will we call this thing?" Rick wanted to know. As every construction

engineer realizes, a project name is important. The bridge we had built on Rick's last trip was the "Dickey S. and George A. Platz, Jr., Memorial Buddha Bridge," named in honor of our deceased parents, and Rick had even prepared a sign so stating. I replied that I thought maybe "SSP" would be a good working name, standing for "Suspension Sap Pipeline." Neither Rick nor Andrea seemed very excited about this suggestion. Andrea observed that if we had to go through with this foolishness of developing an acronym, it at least ought to have "SAP" in it, and what about "OSAP?" (Her suggestion was undoubtedly influenced by a recent letter from her eldest son speculating that our forthcoming sugaring efforts might pose a threat to OSEC--the Organization of Syrup Exporting Countries.) It was a brilliant suggestion. It took only a minute for us to agree on the official project name: the Overhead Suspension Sap Access Pipeline. The OSSAP Project was born.

Several days of good sap flow delayed a full-scale launching of the OSSAP, as we had to spend most of our time collecting sap (from the maples on the near side of the ravine), splitting wood, tending our fire, and boiling the sap into syrup. During the interludes when we managed to have all three pans full and bubbling, Rick and I examined the terrain and conferred as to the precise location of the OSSAP. I had originally hoped to have the pipeline come directly to the sugarhouse at an elevation high enough to fill a holding tank from which the sap could then run down into the evaporator pans, and I had selected a point on the opposite side of the ravine which had a clear line of sight to the sugarhouse. In order to build the pipeline this way, however, we would have to start it from a tower on the other side of the ravine so as to provide a sufficient slope to cause the sap to flow across the ravine to the holding tank.

Despite the prospective additional pleasure of constructing the tower, Rick counseled against my proposal. There were no usable trees near where I wanted the tower so we would have to build it high enough to attach the suspension cable as well as the pipeline. Furthermore, carrying sap ten or twelve feet up the tower in order to introduce it into the pipeline could be very hard on my touchy back. And besides, Rick was only going to be here for two weeks and did I really want to start a project that I might have to finish all by myself?

One or more of these reasons persuaded me, and we ultimately adopted Rick's suggestion that we secure the suspension cable to sturdy tree limbs and have the pipeline run from the opposite bank to a flat place on Pointe George that was actually a few feet below the sugarhouse.

A cold front arrived a day or two later and the sap stopped flowing for a while, so we began to work in earnest on the OSSAP. We decided that as long as we were going to make this thing we wanted to be able to see it amongst next summer's greenery. We bought some orange polypropylene rope for the suspension cable, some thinner yellow poly rope for the lines that would hang down from the cable to hold the pipe (we called these "stringers" although there is undoubtedly a more technical engineering term) and some blue poly rope to run along the pipe and just above it to hold the stringers in place (which we call, appropriately enough, the "blue line"). (Red rope was out because of a common inherited affliction of color-blindness.) We also made some crucial measurements. By positioning a carpenter's level on the shelf of a stepladder and sighting along it, we could compare the elevations of the beginning and ending of the pipeline. By the simple expedient of stretching some string across the ravine we made an approximate measurement of the length of the pipeline--244 feet. (It inexplicably turned out to be two hundred fifty feet exactly, but fortunately we had to order pipe in ten foot sections.) And we then bought some two-inch PVC plastic pipe, which unfortunately came only in a light beige.

At this point I found it necessary to return to the office in Chicago for a couple of days, and I left Rick at the farm to make all the necessary calculations. We had to determine not only the length to make the stringers in order to support a straight, but gradually sloping, pipeline, but also where to attach the stringers to the hanging cable in order for them to be spaced an equal distance apart, and how far that distance should be. When I got back to the farm Rick presented me with several handwritten pages of neat detailed tables containing all these dimensions. He also presented me with a gift: the handheld calculator, capable of doing hyperbolic functions, that he had bought to help him with the calculations. "Every farm should have one," he said.

And Rick also presented me with a problem. Because it would be necessary to lower the cable, once in place, in order to attach the stringers to the pipeline, he had figured the amount of tension necessary to pull the cable and attached pipe back up to the proper level. It was considerably more than just the weight of the pipe. Even the two of us together might not be able to pull the cable into place without difficulty if the pipe weighed more than fifty pounds.

With my customary optimism I opined that our two-inch plastic pipe was within this limit. With his customary caution, Rick bought a little scale. Each ten foot section weighed four pounds. We returned that pipe and bought some inch-and-a-half pipe. That still weighed over three pounds per ten-foot section. We finally had to settle on three-quarter inch CVPC plastic pipe. In retrospect, I wonder why I ever felt we needed anything larger.

We now repaired to the warm farmhouse to assemble our cable and stringers. We would first put a knot in the cable where each stringer attached. The poly rope used for the stringers was made so that a loop could be woven in each end with the use of a device that came with the rope called a "fid"--a plastic shield, not unlike the cap of a pen, that went over the end of the rope. The loop at the top end of the stringer went through the knot in the cable, and the loop at the bottom would hold the pipe. We also used a fid to weave the ends of the pieces of blue rope together to create the blue line, which we then tied to the stringers just above the pipe loops. It is rather surprising how many hilarious jokes can be made, late at night after a few brandies and a long day of measuring rope and tying knots, out of the word "fid."

As Rick, the fidmaster, fidded and I measured, we were interrupted by a somewhat inebriated local snowmobiler whose machine had broken down outside our house. Identifying himself as an ex-Navy man, the snowmobiler professed to be an expert on rope and knots. Between unsuccessful phone calls to "friends" who apparently were unwilling to come help him with his disabled vehicle, he gratuitously reviewed our work and pronounced it acceptable. We almost didn't mind having to finally go out and help him move his snowmobile to a safe spot and drive him into town.

The cold weather that stopped the sap had brought the six or so inches of snow that the snowmobiler was enjoying--the first decent snowfall, in March, of that unusual winter. The snow made things a bit more difficult for the OSSAP project. It was just deep enough, especially in the drifts, to interfere with my tractor and ATV and made the half-mile walk from the farmhouse to the sugarhouse arduous. But we had finished the knotting and the fidwork and were ready to move into the field. Fortunately, I had two pairs of cross-country skis and a plastic child's sled. A quick trip to Buchanan procured some ski boots for Rick, and we set out to hang the OSSAP. It was an odd procession. Rick, the Californian, led the way, his first time on skis. I followed, and behind me, pulled by a rope around my waist, was the plastic sled containing the cable, stringers and blue line, all carefully wound around our homemade wooden bobbin. And bringing up the rear was Honey, my aged golden retriever, bobbing up and down through the snow like a porpoise playing in the ocean.

The cable hanging went fairly well notwithstanding the snow and a few last-minute design changes. A wood block with string attached was thrown over the heavy branches, about twenty feet high, from which the cable was to be suspended, and the string was used to pull the rope cable into place. As a precaution against these branches breaking, a "fail-safe" rope was tied to each end of the cable and attached to different branches. We used a stepladder to put cleats in the trees to secure all rope ends beyond the reach of casual trespassers. And, after some debate, we put a reducing pulley arrangement on one end of the cable to make raising and lowering the cable easier. By this time we were afraid that even the three-quarter-inch pipe might put too much tension on the cable. After the cable was up, we tied the blue line at each end, and it looked like it might work.

The next day we were out bright and early to put in the pipe (which we had fortunately taken out to the site before the snow fell). It was a piece of cake. Rick threaded the pipe sections through the stringer loops and held them in place while I glued on the connectors. By noon, two hundred fifty feet of three-quarter-inch CVPC pipe stretched across the bottom of the ravine. We pulled it up into place and stood back in awe. With the exception of a few tiny dips caused by stringers that were probably not to specs, the OSSAP

looked just as we had pictured it. It was more than a great engineering project. It was a work of art, with a delicate orange curve and thin yellow, blue and beige lines, so obviously manmade, imposed upon--but not changing--the wildness of the forest.

I don't mean to suggest that everything happened exactly as planned. We thought we would have to cut off a few feet of pipe, but two hundred fifty feet turned out to be the exact distance. More significantly, the rope we used for our cable had stretched by about two or three feet, making the stringer on one end useless and pulling all the stringers slightly farther apart at the top than intended. The ends of the pipeline did not wind up at the exact elevations we had predicted, perhaps because of the stretched cable. But nevertheless we had a reasonably straight pipeline going from one edge of the ravine to the other, with enough pitch, we hoped, to cause the sap to flow.

The OSSAP was not, however, yet functional. The north end--the high end--was too high to permit one easily to pour in the sap while standing on the ground. So in a burst of activity Rick built a platform there--the OSSAP Sap Injection Platform (or OSSAP-SIP, as it is now known). We also had to build a basin to place on the SIP, with a drain hose leading to the OSSAP, to receive the sap from the sap buckets. (Actually, Rick and I each built a separate basin because we couldn't agree on how to do it. Both of them work.) And lastly, we put a hose connection at the south end of the OSSAP, to permit the sap to run into a collecting tank.

Even before we finished the OSSAP (and the OSSAP-SIP) the weather had warmed up and the sap had begun to run again. Now it was time for the crucial test. We tapped about ten trees on the north side of the ravine and waited for the sap buckets to fill. When there was enough sap, we set up our basin and hoses and began pouring it in. I stayed on the north side to keep the basin full, while Rick took the five minute walk through the ravine and back to the sugarhouse. "How's it coming?" I shouted. "Nothing's coming," he answered. What could be going wrong? The sap was clearly going into the pipeline. Was it just collecting there? Or leaking out? I sighted along the OSSAP. Sure enough, about halfway across or so, there was a definite sag in the pipe. I pointed it out to Rick. He studied it carefully, then

called back, “It’s moving.” And so it was. Slowly but surely the sag was moving down the pipe. I walked down into the ravine to get a better look. By the time I reached the south end of the pipeline a clear steady stream was gushing into our collecting tank. I went back and added more sap to keep it flowing, and when we had enough we boiled it down into some of the best syrup I’ve ever tasted.

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Whether or not another drop of sap flows through the OSSAP the project will go down in history as a success (this being, in all likelihood, the only history it will go down in). It has been a high spot of the tours we require all of our farm visitors to take. I especially like to hear their question, “How did you manage to climb out on that thing to hook up the pipe?” And when Rick returns to the farm we share many pleasant reminiscences about creating the OSSAP and the OSSAP-SIP. “You know,” Rick has said on more than one occasion (quite a few more than one, actually), “in a few years they’ll probably be making OSSAPs in factories in Japan, with robots. And we can tell our children, why when we made our first OSSAP we tied all those knots ourselves, with nothing but our bare hands and a fid.”