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# CM

# Composites Manufacturing

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# to create Tech



*These historical profiles in CM's series to celebrate pioneers in the composites industry and the record of their accomplishments go beyond chronological documentation to explore personalities and examine the culture and personal circumstances that nurtured these industry leaders and set the conditions for their success.*

# NOLOGY



## ❖ On the Mormon Church, Family History, and the Hard Work of *Larry Ashton*

Twice in Larry Ashton's life, after working for a time in Southern California, he grew compelled to return to his native Utah. He is a man very much at home in the community his Mormon ancestors helped settle, a place where the epic code of "starting with nothing" is passed down to ever burgeoning generations. Utah—industry is the state motto ("Utah Works") and the state emblem is a beehive.

When I arrive December 7th to interview Ashton, "White snow, black ice; First big winter storm brings slippery roads, frigid temperatures," is the *Salt Lake Tribune* headline that greets me at the airport newsstand. Temperatures hover in the upper teens, but it is not the raw chill of a damp New York or even Washington, D.C. winter, the kind that cuts to the bone. There is a confident warmth here that, during the day when the sun invades the marrow, tempts some to tool about in shirtsleeves.

The Enterprise agent, a Southern California transplant well-armed with buoyant ski talk and rehearsed warnings of bad weather, advises me to upgrade to a SUV and then appears let down when I tell him I won't be hitting the slopes this trip. When I turn the key, the solid V6 in the '05 Jeep Grand Cherokee starts with barely a sound and I notice, beyond how the sun cuts through the chill, the overall lack of urban background noise. That familiar, underlying, metallic din that inspires modern life to chase its own tail is somewhat lost here to some high elevation law of insulation.

As I head south on Interstate 15 toward Provo and Spanish Fork I continue to make mental notes of Ashton's surroundings and try to fashion some ideas of what kind of environment influenced the founder, chairman, and chief scientist of Rocky Mountain Composites (RMC). Dry and feathery snow is everywhere, but unobtrusive. In the Northeast snow is an unexpected, rush hour nuisance. Here, in Utah, easy to powder off sidewalks and windshields, snow belongs to the quiet.

Roads in this part of the state are uncomplicated, easily navigable in their cardinal East-West/North-South grid. It seems impossible to get lost, but since the Wasatch Mountains always loom close, it also seems all roads beckon beyond the rocky peaks to some unknown future outside the snow globe atmosphere, as arcane and alluring a destination as one can imagine. Later, I consider that the mountains provide an underlying contrast of permanence and destiny to the quietly restless people who inherit this culture of challenge and new starts. Harsh terrain that doesn't have much to give; easy-going, protective, hard working people, but people dedicated to the harsh, beautiful terrain. Ashton will tell me during the interview that when Brigham Young decided to plant his disciples in the Salt Lake area, natural resources, even to the point of arable soil, were scarce. By the time we went to lunch, as we passed small herds of cattle picking at dead winter grass through patches of ice and snow, Ashton, cheering his home turf, named a number of agricultural victories—apple

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By Andrew Rusnak

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orchards and alfalfa—that have been eked out over the years.

But the question is an important one as it helps to shape Larry Ashton's life. Why did he return to Utah and start several composites businesses? With a sentimentalized memory of his childhood, did he somehow believe he could go home again, unlike his Mormon ancestors who traversed great distances and suffered extreme hardships to practice religious freedom and start new lives in a new place? Maybe he wanted to recapture or correct a former way of life after a shattering divorce? Or, maybe still, there's a deeper debt he feels toward those of his distant past, their way of life, what they endured, and what they stood for?

*A brief sketch of my early life and happenings as far back as I do remember. We were very poor indeed; I was working in a woolen factory when I was 8 years old and was there until I was 10 ...when I had an accident. My right hand was caught in the engine and the cards nearly tore it off. This crippled me for a long time .... We were working from 6 O'clock in the morning until 9 in the evening for three pence a day, allowing us little time for meals. —Edward Ashton, Larry Ashton's great grandfather, born in Caersus, Parish of Llangwonog, Montgomeryshire, Wales, August 22, 1821.*

The path to composites industry legend Larry Ashton began with recommendations from two *Composites Manufacturing* contributors, fellow Utahans Scott Beckwith and Brent Strong. Beckwith is the Society for the Advancement of Materials and Process Engineering's (SAMPE) technical director and Strong is an engineering and entrepreneurial technology professor at Brigham Young University. With resume pages full of publishing and lecturing credentials, together they represent two of the go-to heavyweights on the high performance side of the composites industry. And like many who know Ashton, neither can sing loudly enough about his creative prowess, technical agility, overall contributions to the composites industry, and the inspiration and power that paradoxically emanates from this humble and good-natured man.

"You must do a story on Larry," Strong, adamant, said a few years back. "Here's a guy who is synonymous with, among many other accomplishments, most every advancement in modern filament winding technology."

A 2002 Utah Governor's Medal winner, a 1991 American Society of Manufacturing



*Larry Ashton and long time business associate, Jim Winegar, in an outdoor winter retreat.*

Engineers Jud Hall Award winner, and former BYU adjunct professor. A holder of numerous patents (he's lost count) including a helically-wound tubular shaft, foldable fiberglass utility ladder, one piece, co-cured, ISO grid-stiffened fuselage, and filament wound external fuel and potable water tanks. An entrepreneur who started several companies, a tinkerer and inventor, a conceptual "why not" popular mechanic, an advanced out-in-the garage fixer upper kind of nostalgic guy next door, an avatism, a lost art even.

One doesn't have to go far in industry conversation before Larry Ashton's name emerges and becomes associated with technological achievement—helicopter tail booms, transportable bridge launch beams, missile nose cones, and deep water submersibles.

"Our interest in the business has never been to create wealth," he tells me, the point later echoed on cue and verbatim by a young and energetic company president, Craig Simpson. "It's been to create technology."

This spirit runs deep through Rocky Mountain Composites, a high tech

innovator's paradise. Most business owners find the right rhythm for their companies, but this is seldom easy. Usually if the head of a company tends toward the truly one-off creative, an enterprise that can tug at the bottom line, it's not a happy home for accountants. If an idea, however, is destined for mass production, then leaders of these companies—who, not surprisingly may not be the originators of the idea and are themselves products of succession with different skill sets—need to be far more inclined toward creating wealth. The innovative technical tweaks that come along to adjust the

product or the process, although remarkable, are more often about markets and finances than about being true to one's inner Ben Franklin. Or, in this case, one's inner Larry Ashton.

During the 5-6 hours I recorded his life story, I rode a humility train so absorbing, I didn't realize until later that Ashton never once mentioned his many recognized achievements. Lists of accolades are truly not how he marks time, progress, or accomplishment. And like so many first generation pioneers in the composites industry, his story goes way beyond the clichéd 'How did you get started in the business?' Family and family history are as critical to the composites industry—and Larry Ashton's foray into it—as the discovery of fibers and resin.

After he recovered from having his right hand nearly ripped off at the woolen factory, the young Edward Ashton found board with a merchant family, tending to their store and home. He also waited on an old "helpless" gentleman.



*Larry Ashton's wall of fame and the men who've helped him in his career.*

“They were very kind to me,” he notes, in a memoir updated by family members in 1930. “I was there for two years ... but my mother[s] ... brother had died and had left a little money to apprentice us—my brother and me—and to care for our little sister.”

When Edward was six, his father Richard died. With no means to support her children, and with hopes of investing her brother’s inheritance in her son’s future, Edward’s mother Elizabeth searched and searched for a suitable tradesman in which to apprentice him. Finally, for board and six sovereigns, she bound the boy to a cruel shoemaker for three years.

“I suffered a great deal of abuse and was beaten awful by him. He would stride me with anything nearest him, as though he wanted to kill me. I did not have half enough to eat and of the poorest kind, and I had to do all kind of work but my trade. I was beaten and starved until I became stupid.”

Early one morning, realizing he was late, Edward, with just his pants and shirt, dashed into the little shop and made for the corner where his bench was located.

“He followed me and doubled me that I could not straighten up. He had in his right hand a stirrup and held me, then the stirrup



Larry (squatting right bottom) in an extended family photo.

was used and he gave it to me as hard as he could. He pulled my ears until they were bleeding, and my nose was bleeding awfully.”

The cobbler then lifted his bony apprentice by the feet and slammed his head into the bench. Disoriented, besmeared with

blood, Edward escaped the shoemaker’s grasp and ran into the street. The shoemaker followed him. A passerby, a man, stopped him and asked what was wrong before quickly putting it all together. The man shook his fist and dared the shoemaker to come any closer. Edward cleaned himself up best he could and walked with the man until he reached home.

“After this I had to go before the magistrate to break the bonds that were made for my apprenticeship, and there I was stripped and examined. There were 13 stripes that had swollen. I was liberated.”

Joseph Smith, the proclaimed prophet and founder of the Church of Latter Day Saints wrote in 1824, in section 128 of his Doctrine and Covenants:

*And now, my dearly beloved brethren and sisters, let me assure you that these are principles in relation to the dead and the living that cannot be lightly passed over, as pertaining to our salvation. For their salvation is necessary and essential to our salvation, as Paul says concerning the fathers—that they without us cannot be made perfect—neither can we without our dead be made perfect.*



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The importance of family history to the Mormon faith is not a mere matter of personal interest, or even a strong desire to uncover one's origins, one's connection to place, people, the past. It runs straight to the heart of salvation—"neither can we without our dead be made perfect."

The stories of the dead must be the stories of the living, the adventures of the dead, the adventures of the living, and the suffering of the dead, the suffering of the living—a sentiment further explained recently by Mormon Church President Gordon Hinckley who stated that Smith, "declared that we cannot be saved without our forebears, those who did not have a knowledge of the gospel and consequently could not fulfill its requirements nor partake of its opportunities." Smith goes on to quote Corinthians: "Else what shall they do which are baptized for the dead, if the dead rise not at all? Why are they then baptized for the dead?"

Edward Ashton would continue to struggle, but live an epic life worthy of a Hollywood film—from Dickensian child labor to Wild West shootouts. It's hard for us who live in the 21st century with email, 24-hour real time news, speedy air travel to remote locations, and a twisted sense of irony to imagine a life like his. To sit and write a letter that could take months to arrive, to make a life or death decision to go to sea for weeks at a time to befall another continent, or to walk across the great plains of America to start a new life is, perhaps, beyond our reach, beyond our comprehension. Maybe the episodic short takes that have become modern life—the degeneration of patience and long-term focus, the fatalistic sacrifice to turnover, the advent of more and more noise, less and less silence—have eroded our sense of destiny, have atrophied the idea that we must always try to reach something we know we'll never ultimately reach. One can always build a better airplane, automobile, business, or paragraph in a magazine article. But why bother, it's all becoming "good enough" just the fast way it is. And why do we joke about how far our grandfathers had to walk to school ... in the snow ... in their bare feet?

But Larry Ashton realizes he *has* a destiny, to create composites technology, a worthy call, an ideal with practical rewards not unlike his great grandfather Edward's fortune to escape persecution and eventually find peace, work, and worship in the Utah Territory.



Ashton with wife Joan and sister-in-law Brenda.

It's a cold 8 degrees when I check out of the Fairfield Inn in Provo and head for Spanish Fork, home of Rocky Mountain Composites. Just a short hop down I-15, I arrive early and sit in the parking lot to make notes. Nestled in a field near a National Guard Engineer's Battalion, the plant starts to catch some of the sharp, winter morning angles the sun shoots against the sides of surrounding mountains.

I'm scheduled to meet James Winegar, RMC's public relations point man and Ashton's brother-in-law. Winegar has helped sort out the logistics of Larry's interview as well as provided me background info, like copies of the Ashton family history as written by family members. His role here is to protect the company's image and interests. It's important to screen even trade publication reporters who must quickly build trust to get to the heart of a story. When I sit down with him in the conference room, he feels me out with a comment that a local reporter didn't quite connect on a recent article about RMC. I'm used to circuitous inquiry. I'm not interested in drama, I say, just a "simple but detailed life story. Shouldn't take more than a few hours for the interview. But then I usually become a pain in the ass because I have to call back to verify details."

Winegar looks me over. There's a clear and easy path to obstinacy in his patient look. He can bull dog if he has to. But I also detect a witty and animated sense of shop humor. After I dig out a few old articles I always bring to help break the ice, Larry Ashton walks into the room and the conversation quickly turns into a friendly "who knows who" in the industry, but not without Ashton also throwing some hard penetrating eyes my way. I'm beginning to feel like a test sample gone bad.

After more "scatter talk"—clean desks equal sick minds, the importance of teamwork, synergism, the foibles of memory—it doesn't take long before we find a friendly rapport and Winegar bestows his blessing. "I'll leave you two," he says and

ducks out to tend to business. I'm supposed to sign a two-page "mutual confidential non-disclosure statement," but trust is in the eyes, it's not mentioned, and it seems I've passed the test the old fashioned way, the way men used to use gut checks, meeting for the first time on a city street or a frontier trail, to determine honesty and forthrightness. It reminds me of when Glenn Resnick, owner of Marble Designs in Baltimore, told me that his father, who started the business, never needed a contract, only a handshake

to close a deal.

Since the conference room already is booked for a meeting on patents, Ashton assumes a relaxed countenance of approval I'll see the rest of the day and invites me to follow him back to his office. "Bring plenty of Kleenex," he warns me.

By the time he returned home, Edward Ashton had barely enough time to pick through a string of odd jobs and a short stint with another shoemaker before his mother Elizabeth remarried. "He took charge of our affairs," Ashton recalls of his new stepfather, "and that ended our home. I was determined to tramp." The young Edward took to the road, hiked 80 miles to the small town of Tredegar, Monmouthshire in South Wales where he presented himself as a shoemaker to "about a dozen of as mean and dishonest men as ever could be found." They immediately plotted to steal his clothes, then dragged him to the local tavern to drink and play cards.

Every morning the rogue gang would collect around the cobbler's bench not to make shoes and earn a respectable living but to play cards for most of the day. Edward "gave way and partook of the same spirit and became a great card player and gambler. I turned reckless and careless about working as I could not keep any money."

At the end of this reckless year, Ashton grew weary of his life led astray. But, as is usually the case, the bonds of depravity can be better than no bonds at all, so his need to move on started to battle his fear of doing so. One day, however, which began as normal as any other, Edward had another synchronous encounter with a man in the street.

"A man touched me on the shoulder and we had a little talk. He asked if I would like to go out into the country and work for him about nine miles away. I said upon certain conditions I will, and I went the next day and worked for him for 10 years."

Despite gainful employment and a more abstinent existence, Ashton remained

unsettled about his future. He had experienced enough life now to insure deeper reflection. Sometimes he was guided to the Episcopal meetings and even to join their singing classes. Other times he landed with the Calvinites where he learned the Welsh language and joined the choir. But he never joined either church, although he eventually became a leader of the Calvinites.

"I felt discouraged in their discourse," he recalls in his memoirs.

After a good deal of delay, clearly on a search to fill the hole in his ruptured soul, Edward Ashton, now 28, heard the call of the Latter Day Saints and was baptized in July of 1849. Brigham Young had traveled to England in 1840 to spread the Book of Mormon and convert many among the destitute and urban working class. For most of the next decade, they suffered stories of tyranny and anti-Mormon sentiment coming from America. Joseph Smith was killed by a mob in Carthage, Illinois in June of 1844. By 1847, Young, the new leader of the Church of Jesus Christ of Latter Day Saints, organized an exodus westward, first to Winter Quarters, Nebraska, then to the geographic isolation of Salt Lake City where he hoped to build a strong religious community and protect unpopular Mormon practices like polygamy. Young realized the political strength of organizing the faithful in one place, so he sponsored wagon trains and even pushcarts so converts could trudge the 1,400-mile journey into the American wilderness on foot.

With the promise of shifting Northeasterly winds pushing winter rains onto Welsh vales and hillsides, in October of 1850, Ashton boarded the sail ship Joseph Badger, bound for America. He waved goodbye to the land of the Red Dragon forever. Born in poverty, he lived up to the historical theme of the Welsh people—to struggle against impossible odds, a banner he would continue to carry, like the devout who followed Brigham Young to Salt Lake City. When he skirted past the



Larry (bottom right) with his father Jed and his brother Mark.

bayous and landed at the gulf port of New Orleans five weeks later, he had 10 cents in his pocket.

"My great grandmother, she was about 15 or 16 years old, got attached to a wagon train that was going out to Salt Lake," Ashton exclaims in his office. "But she writes in her journal how they all walked, walked most of the way across the plains. And she walked barefoot. She had only one pair of shoes and wanted to save them for when she got there, you know, to Salt Lake. My great grandfather, Edward Ashton, also walked across the plains. He didn't have a penny to his name."

Ashton's tall loose frame gives way to an active mind that tightens with the excitement of challenge, especially when considering the swirl of adversity that many of his predecessors faced and overcame. To hear him talk at length, one might think of Mayberry reruns in the background. He says "gosh" and "oh boy" and "I'll be darned," and sometimes skips over words, articles more than conjunctions, the way folk who've known each other a long time or share a common rural background speak to each other. During the interview, several times, the man who likes old classic movies expresses concern that he's boring me with the details of his life. Like many of his pioneer brethren in the composites industry,

Larry Ashton is as humble and good natured and widely respected as they come. The battles in his life, the engineering ones anyway, seem not to have been fought so much on the front lines of stifling bureaucratic conflict, but in the quiet trenches of his own autonomy—more and more a lost and forgotten ethos in the world of manufacturing. What drives him, to take the broad view of his career, is exactly that need to create technology.

His office is humble as well. There's a workaholic's couch and blanket for late night rendezvous with projects that can't rest, several family photos on the walls (from two marriages there's nine children, 43 grandchildren, and 15 great grand kids), a desk that looks like it may have been cleaned in a rush, a plant the secretary probably waters, a signed photo from Neil Armstrong. Although still chairman and chief scientist, the daily dynamics of running the employee-owned RMC turned over to the much younger Simpson, it looks as much home study as work space, fitting since the more I got to know Ashton and RMC, the more family-like the company seemed to be.

Larry Ashton was born on December 23, 1931 in a small house on Alden Street in the Sugar House district of Salt Lake City. Established in 1853, just six years after Brigham Young led settlers into the valley, Sugar House retained its name despite the fact that construction of the sugar mill was never completed. A lack of materials from France led to unrefined molasses production instead.

"I was born and raised on a sheet metal table," Ashton, now 74, says with a narrow, neighborly smile. "My dad had a heating and air conditioning business all the time I was growing up. I became an apprentice at a young age. Sometimes I worked with sheet metal workers so I learned a little bit about sheet metal. But I also learned a little electrical, plumbing, refrigeration. I touched on all of those areas. And then when I went to college, I worked for my father on the engineering side of his business."

It quickly becomes apparent as we start to talk how important Ashton's Mormon heritage is, how the mystery of this American story has been remembered and how it affects his approach to life and business.

"It was a big part of my growing up," Ashton remembers. "There were a lot of things taught in the church. There was primary from the time you were a toddler up to the time you were 8 years old. From there, you had young people's organizations that typically would go until you were 18."

His office is humble as well. There's a workaholic's couch and blanket for late night rendezvous with projects that can't rest, several family photos on the walls, a desk that looks like it may have been cleaned in a rush, a plant the secretary probably waters, a signed photo from Neil Armstrong.

Edward Ashton landed in New Orleans with no formal schooling to speak of. He boarded the steamboat Highland Mary bound for Council Bluffs in the Missouri Valley, borrowing the \$2.25 fare, which entitled him to sleep on deck. Cholera, however, “made a raid on the boat and many were taken down,” including Ashton. Weak and sick, having gone six days without food, through the magnanimity of other passengers he finally made it to a boarding house in St. Louis. Two weeks later, he was shoveling coal at Gravary Coal Diggins. For about a year he worked in the coal pit, also teaching for a branch of the Latter Day Saints church, until July of 1852 when he and a friend, Joseph Badger, started for the Valley of Salt Lake. Destitute, Badger sick with ague and fever, it took them better than two months. When they arrived, they found refuge in a tent in the Fifteenth Ward, a western part of Salt Lake City where most of the Welsh Saints lived at the time.

“Before going on to Salt Lake, my great grandmother also arrived in New Orleans from Wales,” Ashton says as he recalls his great grandmother Jane Treharne’s journey recorded in her diary. The Treharnes made their way north to Council Bluffs, but not without tragedy. Jane’s mother Ann succumbed to cholera, which struck the steamboat, and was buried with more than one hundred other passengers on the banks of the Missouri River. For two years the family struggled. The five children, scattered

throughout the territory, worked for sustenance, until the sudden passing of Jane’s father reunited the siblings and they started their way west to Salt Lake.

Ironically, Jane Treharne met Edward Ashton once in Council Bluffs when “a company of Saints came from Wales.” She declared, somewhat secretly to one of her family, that she would one day marry him. Turn the page in the fireside annals of Ashton family history and the two stumble upon each other again, this time in the Daniel Jones Company Wagon Train headed west to Utah. One rainy night that summer of 1852, with hope for a more prosperous future fighting against the sweep and torrent of a Midwestern storm, Jane and Edward each held one corner of a tarp under which a woman also traveling to the city of Latter Day Saints gave birth.

When Jane reached Salt Lake she went to work as a domestic for John Taylor, the third president of the Mormon Church, with the one stipulation that he not ask her to marry him as “she already had a young man.” Edward made shoes for Taylor and his family. Edward and the young Jane Treharne enjoyed a steady courtship, which led to marriage in 1854, the shoemaker marrying the woman who crossed much of the plains in her bare feet.

“Didn’t have a penny, not a penny to his



*Ashton’s passion for innovative process and material changes led to progress in aviation.*

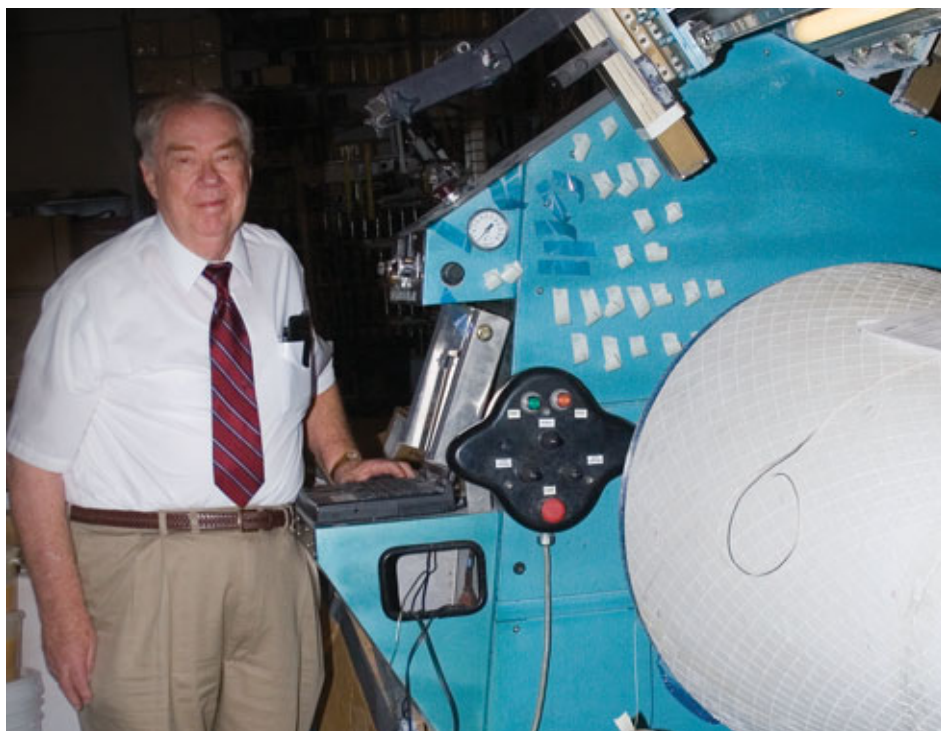
name” Larry Ashton repeats of his great grandfather in what now must work as some resonant, handed down mantra. “That first year was very tough for the pioneers, they had all kinds of problems, all those people coming in and no food. I remember reading that my great grandfather got 50 cents for doing something and he walked all the way up to Box Elder [now Brigham City], which is like 55 miles from Salt Lake, trying to find more work. Anyway, he raised a bunch of kids. He made sure they all went to college and they all became professionals. My grandfather was one of them.”

Edward Treharne Ashton, Larry’s grandfather, started Ashton Improvement, a general contracting business and the Consolidated Stone Company, which mined granite from a Little Cottonwood Canyon quarry.

“It just amazes me, all this happened in one generation,” Ashton continues. “From absolutely nowhere, he started with nothing and became a successful general contractor. Along with the state capital, he built a number of major buildings around the west, but mostly he built power plants. Some of his brothers were educators, some were in businesses by themselves. They all had a good work ethic.”

As mandated, or strongly pushed by the Mormon Church at the time, Edward T Ashton—one of seven children—practiced polygamy and had two wives.

“One common practice, if someone had any wealth at all, a position in the city or in the church, was to sponsor a family who had joined the church somewhere else,” Ashton recalls. “You assumed responsibility for getting them to Salt Lake. Well, my grandfather sponsored the Lindsay family out of North Carolina. They had joined the church back there. He brought them out, provided them with a covered wagon to get them here. He put the father in the candy business. Henry, I think his name was. There was a



*“I was born and raised in a sheet metal table,” says Ashton.*



place in Salt Lake called Lindsay's Candies for years. I'll never forget it. The boys he put in the construction business, and the girls, well the only one I ever really knew was my grandmother. He hired her to work with his wife, in the home, as a helper. She was 19 years old when she came out. A few years after that, he was asked to work into the polygamy thing. They were sort of told to do it. They had to get permission from the first wife, which he did. So he married my grandmother, who was very beautiful."

Ashton's even-tempered tone and patient speech smoothes out parts of his narrative like butter on hot bread. When he talks, he deposits respect, and after he closes out an anecdote, the promise of inevitability catches up to the force of divine change and puts the whole story in a deeper place. And not without humility and a sense of pokey humor. He's also sensitive to how others (myself included) might interpret this part of his family history, but confident the big picture offers context. In the high, unarable terrain that no one else claimed, Mormon's planted deep roots. They cultivated their community and grew their religious charter.

In response to public outrage over plural marriage, however, the U.S. Government incarcerated many church officials and confiscated their property. In 1890, Wilford Woodruff, the church's fourth president, claimed a vision from God and required all Latter Day Saints to "...refrain from contracting any marriage forbidden by the law of the land." Vehemently denied by Woodruff, some versions of history have him issuing the manifesto against polygamy in exchange for statehood, which the U.S. granted to Utah in 1896.

"As far as my father was concerned he had 2 mothers, and he was as welcome in one house as he was in the other," relates Ashton. "My grandfather's first wife had I'm pretty sure nine kids, and with his 2nd wife, who was my grandmother, had 12 or 11 actually. I think she lost one in childbirth. So, all and all there were 20 kids, two different families, two different wives, a very big family as you can imagine. My dad was very close to both sides. His brothers and sisters, half brothers and sisters were all very close. That closeness didn't exist up to that level in my generation. But again, everyone became a professional. There were architects, doctors. One of my father's brothers was an attorney, a very good attorney, became a city judge. One of his brothers was a brick mason, had his own construction company. So, again, there was a good work ethic."

It's the fiber that runs hard through the Ashton family tree—a robust and sound work ethic. To shovel coal and cobble shoes, Edward Ashton, like many of the afflicted devout, sought purpose in his pilgrimage through the American wilderness. He found redemption through suffering and desultory claims to hard labor. The spiritual sustenance he gathered he passed to his firstborn, Edward Treharne, while the young boy sat and listened to his father's stories, sat and watched his father's hands mark and pierce and cut pairs of shoes. By the age of 22,

Edward Trehorne Ashton used his hands to mark and cut granite. A skilled mason, he helped fix the Ashton family in the age of inexhaustible industry and monolithic monument. The Consolidated Stone Company of Salt Lake, of which he was president, built the Utah State Capitol and every hydroelectric power plant in the western United States. Jedediah Lindsay, the seventh child of Edward T and his second wife Cora May Lindsay, started Ashton Heating and Air Conditioning. Larry Ashton watched his father mark and cut sheet metal.

## WATERJET COMPOSITE CUTTING



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The great grandson of Edward did not have to walk continents, scrounge for work, or conquer unarable land. No one has to pull the corners of tarps anymore. Congregations of common sufferers have become air-conditioned congregations with common interests and “Survivor” is for reality TV. Larry Ashton, thanks to his great grandfather, enjoyed more choice on where and how to find his own bliss, a path that opened to the “luxury” of imagination and a push for innovation in the fledgling composites industry. When he went to work, his sons watched him mark and cut fiberglass fabric and preimpregnated carbon fiber—the same hands on the same tools, the same fate, promise, and legacy.

Still, the idea that entrepreneurialism helps protect religious freedom, that endurance and business acumen promote not only economic autonomy, but way-of-life values, runs strong through the hearts and minds that reside in Utah.

When later I ask Ashton if he still thinks people embrace the trail-blazing challenge of business, he tells me he encourages his employees to find or start jobs they can be happy in, and that one way it is different today is in how much the current generation knows the digital world. “Young kids now,” he said, “I can’t even hold a candle to them.

But I don’t know if it’s different, probably not. There are still a lot of people going into business for themselves, especially in this area.” Then he goes on to tell me why he thinks this is. “The pioneering thing, there’s Brigham Young University and the missionary training center right next to it here in Provo. The bulk of the 30,000 missionaries a year that go out, you know, preaching, spend two years typically learning different languages but mostly how to deal with people. When they come back a lot of them decide well, because they’d been missionaries and went to Brigham Young, they can start all kinds of businesses. The pioneer heritage might be part of it, but I think also that this experience is too. My brother went to Australia on a mission. Four of my boys have been on missions, to Costa Rica, Missouri, Alabama, and Korea. My mission got cancelled. I was called to go to the Pacific Northwest. But that was 1950 and the Korean War was going on. The local draft board in Salt Lake made a deal with the church that they wouldn’t call on any missionaries until the Korean thing was settled. And before the opportunity came back to me, I was married. But my dad and all his brothers went off on two-year missions. My dad spent his, actually it was three years, in Germany right before Hitler came to power in the early 20s. So you learn

a lot of independence and maybe the ability to make the decision to start something.”

One thing Jed Ashton started when he returned from Germany was a relationship with Leone Hales. A native of Rexburg, Idaho, Hales moved with her parents at an early age to Salt Lake where the family practiced Mormonism. The couple met through the church and married after Jed went into business.

“My parents had four kids, two boys and two girls,” he [Larry Ashton] says. “I’m in the middle, third from the oldest. My younger brother was a captain for Western Airlines. He died early, about mid 40s or thereabouts, from a heart attack. That was quite a surprise to everybody because he was in really great shape. My two sisters, one of them is married to a high school football coach, a football player from the University of Michigan. Then my other sister is married to, again, a star football player from Salt Lake. He started his own electrical business. Anyway we were never a real wealthy family, never. But we were a family that did a lot of giving. My dad was a great one to help people. One of the things he was favored for, and I have to think about it this time of year, close to Christmas, was putting in heating systems, primarily for widows. He would do a lot of stuff like that. He was fairly well-to-do, but



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didn't get rich, not rich at all."

I hear the same trace of lament in Ashton's voice that I've heard before from Brandt Goldsworthy and others, the lament of not having been more financially rewarded for a life of hard work in the composites industry, that "people don't make a lot of money in this business. There's been a few, but no big fortunes I don't think."

But Ashton's words speak more to the significance he places on being happy in one's chosen field, accepting the call not just a job, than with any deep regret about entering the composites industry. He's not a hypocrite. He takes his own advice. Larry Ashton inherited the ambition to start several businesses from scratch, but it's always been about creating technology and advancing the mechanical and material knowledge of the composites industry. He just can't pump out widgets for profit, or look back on his career with any sense of accomplishment if all he'd done was salute the fettered laissez-faire rules of capitalism.

*I have to tell you, if I have any success, it's because of the people I've been involved with. I'm talking about Doug Mitchell and John Anderson who was a whale of an engineer. And Dick Young was so supporting in helping me get started. — Larry Ashton*

Many of Ashton's earliest recollections start with the beginning of World War II. Somehow, a look back can make small things large, and around the neighborhood of Sugar House, under the stress of sending sons and daughters off to fight fascism, there were many Blue Star Flags hanging in the windows of people's homes. It's not hard to see 10 year old Larry Ashton hoofing it over to his grandmother's or on his way to the grocery for his mother, spotting and counting the number of stars and trying to figure who he knew that now served in the armed forces. Blue stars that turned gold if someone wasn't coming back, and some in Salt Lake didn't. Despite their discordant history with the U.S. Government, the Mormons of Salt Lake evolved into profoundly patriotic, flag-waving citizens. It had only been a hundred years since a musket-bearing mob—some historians would claim with government complicity—surrounded church founder Joseph Smith, who'd been charged with treason, and executed him.

From the lingering uncertainty of a world at war, some sought relief on Friday nights when the recreation room at the church converted to a movie theater.

"My friend used to run the projectors," Ashton says fondly. "We had, you know, two

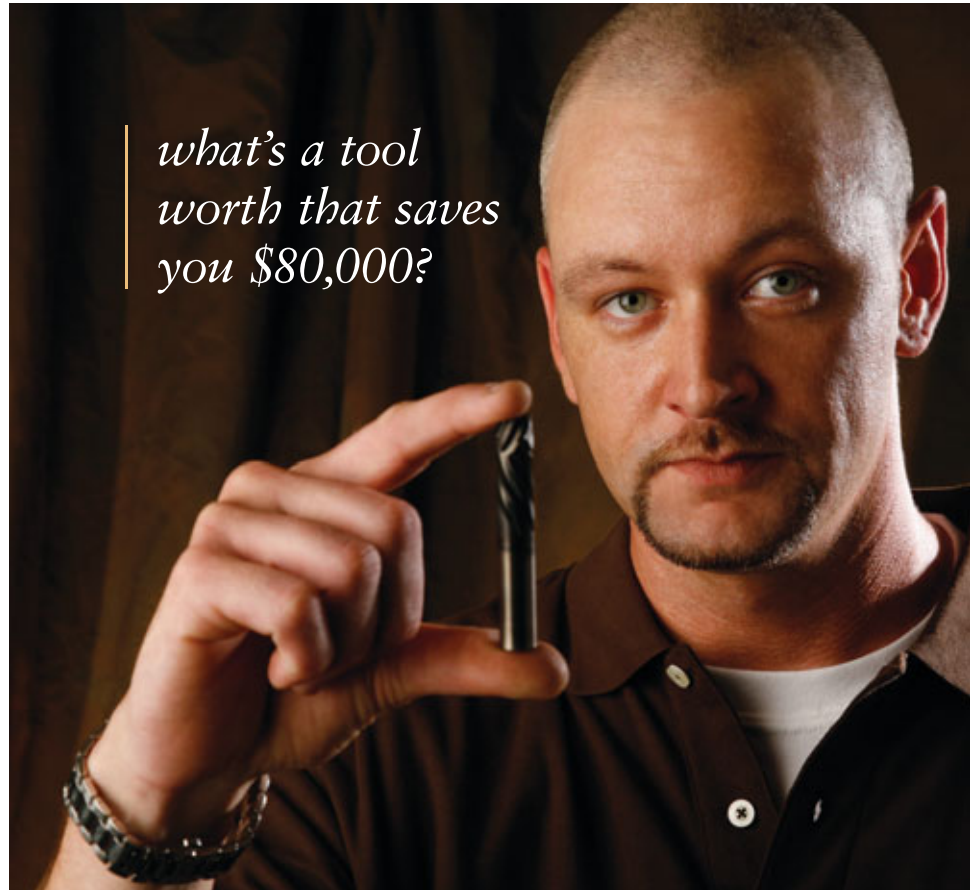
projectors, and you could sit down and watch a movie and not have it interrupted. That was a really big deal. That's probably one of the biggest things I do in the evenings now is dig up old movies and watch them."

By the time he turned 13, with American and British troops hitting the beaches of Normandy, Ashton started a run of summers working as an apprentice for his father. As in many young boy's lives, boys who grew up in the rush of industrial mechanization, a period where fathers often stood off to the side on more reticent, authoritarian ground,

certain men emerged as inspirations, active teachers, souvenirs of fond memoir in this very tactile-driven world. For the teenaged Ashton, that man worked for his father and was named Doug Mitchell. When he wasn't studying the few remaining men of rifle-wielding age employed in Salt Lake load ice into the backs of trucks at the ice plant next to his father's business, Larry Ashton shadowed Mitchell, a master mechanic and self-taught engineer, and learned as much as he could. "He could do anything," Ashton

*("Larry Ashton..." continues on p. 67)*

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("Larry Ashton..." from p. 29)

said with a trace smile, issuing the highest compliment of the industrial age. Translated, it means he has the ingenuity and skill to build anything.

"Yeah, my job was to hand him the wrench. Go ahead and do something is what I think I learned working with Doug. He was the kind of guy that said, 'You know what? I'm gonna build a steam engine for a little train.' And he set about building a little narrow gauge train that you could actually ride on, with an operating steam engine. He could build any part of it, from scratch. He built his own airplane, was a glider pilot. I learned an awful lot from him. You know there are people who won't try anything. They think it's gonna be too hard, or they don't think they can do it, or, for whatever reason, they don't try. We have people here, good engineers, we kind of have to push to the edge. They'll take something right up to the point of getting it done, then, they'll just stop. I find that really annoying."

Fear of failure (or success depending on how you look at it), is something Ashton learned to abandon early and probably accounts for most of his achievements. In fact, as he gradually caught up with his precarious family history, the idea of risk gradually overtook him. He decided to spend one summer while still in high school as a hod carrier instead of working for his father. And after graduating Salt Lake's East High in the spring of '49, he spent the summer before college convincing his mentor Doug Mitchell to start his own business, which he eventually did, Mitchell Heating and Electric.

Ashton's growing appetite for risk continued at the University of Utah. An admittedly distracted student when it came to cracking books, he yearned for the hands-on requisites of his mechanical engineering degree—the labs and machine shops. Very adept at remembering names, he recalls another student, Kelly Thurston, who "was the same way," who shied away from books and for his senior thesis built, tested, and installed in his old Nash the early 50s version of a rotary engine. The result was an employment offer from General Motors. Ashton is not sure if Thurston ever even graduated, only that he was "not a theory guy, [but] all practical." Ashton as well shunned comprehensive exams and opted for the thesis, constructing a ramjet engine that he tested in a field near the school.

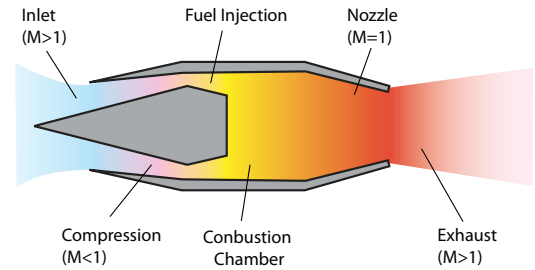
"Let's back up," Ashton tells me, enthusiastically leaning into an explanation after I claim ramjet ignorance. "You know what a pulsejet is? That's the V1 bomb the Germans sent to bomb London. It's called the buzz bomb? Well, a pulsejet has a combustion chamber with spring valves in it that open and close in a frequency matched to the length of the pipe. So, it pulls the air in, compresses it in the combustion chamber, and shoots it out. My brother and I made these for several years testing them, for fun, putting them on a wheel and having them spin around the driveway. There's a loud boom. We tried to make a big one to put on a bicycle, which, good thing it didn't work, because it probably would've killed us."

Like most pioneers of the composites industry, to get Ashton to talk insightfully about his personal life is akin to dental surgery. But to talk about technology? That's like driving an old roadster on an 80-degree day with the top down. The ramjet explanation wasn't any easier, so I just kicked back for the ride.

"I developed a thesis then, to develop a flame holder that would hold the flame in a ramjet, because a ramjet doesn't have valves in it, doesn't have anything other than the ... you just squirt the gas, in this case propane, into the combustion chamber, you let the force of the air coming in, the ram force of the air, keep the flame from going out the

## Design

Schematic diagram showing simple ramjet operation, with Mach numbers of flow shown. A ramjet, sometimes referred to as a stovepipe jet, is a type of jet engine. It contains no (major) moving parts and can be particularly useful in applications requiring a small and simple engine for high speed use; such as missiles. They have also been used successfully, though not efficiently, as tipjets on helicopter rotors. From ramjet Wikipedia: <http://en.wikipedia.org/wiki/Ramjet>.



front, as it explodes and goes out the back and develops thrust. It's really very simple, it's just a tube with a flame holder device on it. So, that's what I did. It worked ... kind of. It was really crude, but it worked."

One day, Ashton decided to field test his thesis. As he explains it, he purchased a tower, mounted the ramjet on the end of a boom, used several aircraft motors to feed spark and power and turn the engine until it roared to life with flames shooting out the rear. Ashton must have designed risk aversion out of his ramjet. All fired up with no where to go, it took off and headed straight for a construction crew working on the roof of a nearby house. He laughs about it now, but this little tale offers a telling metaphor for Ashton's career and philosophy. And if there's a litany, it's that there can be no success without failure.

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When the recruiters came around, he was sure he would get a job offer from ramjet manufacturer Marquardt in Van Nuys, California. Instead, in December of 1954, Ashton took his hard-earned diploma that had taken five years to get and headed for Hughes Aircraft in Culver City, just east of Santa Monica, the only company who offered him a job. The new junior design engineer wasn't alone though. As he tells the story, his face sets a little sadder and he points to two photographs of his children on the wall of his office.

"I knew her in high school," he says of his first wife. "She was a year ahead of me, very popular, and so we got married. The way that turned out, she was on the rebound. She'd been engaged and going steady with a guy, a good friend of mine that I knew in high school ... ever since junior high. So, that was kind of a rebound thing. We were married 14 years. That picture was taken a few years ago. It's my family of that group. We had 6 kids. And the top picture, those are all my kids, both families together."

Right out of college, Ashton's drive to succeed kicked into a higher gear; a new wife, the desire to start a family, only one job offer, and the burden of a legacy devoted to struggle and plotted to measure the success of one generation against the next. His drawn face lightens up as he talks about summer family reunions at Newport Beach, how both families get along just fine now, how his second marriage to Joan has turned out for the better. But he's also come to accept the hard lesson of balance in modern life, work vs. family time. "So anyway, I learned a ... that's where ... would tell you ... I probably learned that work isn't too important," he says, still struggling with the idea as he shifts his weight on the sofa in his office. For a year after the divorce, work wasn't important at all. Although in hindsight Ashton claims to have seen it coming, the initial shock of being served separation papers by the Sheriff's Department early one morning upon arriving at the office gradually gave way to a protracted bout of depression, which he attributes as the main influence in losing his business at the time. "If you've ever been around anyone who has been divorced, well, there's a year where you just might as well draw a red pen through it, because it's a mess." And he attributes meeting Joan and heading back to California in '66 for a fresh start as the main reason for getting his act back together. His face relaxes even more as he points to her photo.

But in 1954, assigned to the rocket motor department at Hughes Aircraft, one of Ashton's first tasks was to look into fabricating a fiberglass nozzle for the Falcon missile project. Mind you, he's quick to point out, there's really

nothing that has anything to do with fiberglass anywhere in the early aircraft industry of the mid 50s. He mentions Brandt Goldsworthy, who'd started around that time as well, but the nozzle project was Ashton's first foray into the world of composites and served as somewhat of a definitive moment. To this day the scenario is all too common in engineering circles, pitting the "unknown" and suspicious properties of composites against the conventional confidence of metal, in this case titanium—lightweight, "glueless," solid.

The idea, of course, was to reduce weight and increase operating efficiency. The Falcon had a steel motor case and nozzle, with a carbon insert through the throat. The burn time on the original, single-stage motor was approximately one-and-a-quarter to one-and-a-half seconds. In that short time, the steel nozzle starts to erode. And fiberglass is going to solve this problem? Hardly a popular hypothesis, and easily supplanted by another Hughes engineer, an MIT grad who proposed titanium as the material of choice.

"Well, I think you can probably see where this is going," Ashton said. "He won out, everyone thought the fiberglass nozzle was ridiculous. He had this really expensive titanium nozzle machined up, very light weight, and they put it on the motor and test fired it and it lasted a quarter-of-a-second. Titanium burns, just like it was made of magnesium because you have oxidizer in the fuel. So it just went "bang" the nozzle just disappeared, in a quarter-of-a-second."

Ashton laughs at the memory, spikes it with irony. He goes on to explain that the failure of the titanium nozzle did nothing to boost management's confidence in even trying fiberglass although six years previous in 1948 the Allegheny Ballistic Laboratory (ABL)-X248 rocket motor was fabricated with a filament wound, fiberglass and epoxy resin nozzle. The ABL-X248 was primarily used as a second stage, solid propellant booster. The Falcon composite nozzle project was scrapped. Not too long after, however, entire rocket motor cases were wound out of glass for the Minuteman, and fiberglass nozzles today can last 30-40 seconds. "We were on the edge of what would have been a very, very significant development," Ashton laments.

Ashton stayed at Hughes only a year. He and his wife returned to Utah. But before they did, one day at work, Ashton picked up a magazine being passed around the office and read an article about a man in New Jersey who worked on very innovative and cutting edge technology—filament winding fiberglass rocket motor cases. "The fiberglass nozzle, everyone thought that was a bad idea, but if anyone thought you could withstand a

couple thousand pounds of pressure inside a rocket motor case using fiberglass, well, who were they kidding?" Ashton quipped.

That man would come to have a big influence on Ashton and the direction his career would take. That man was Richard (Dick) E. Young.

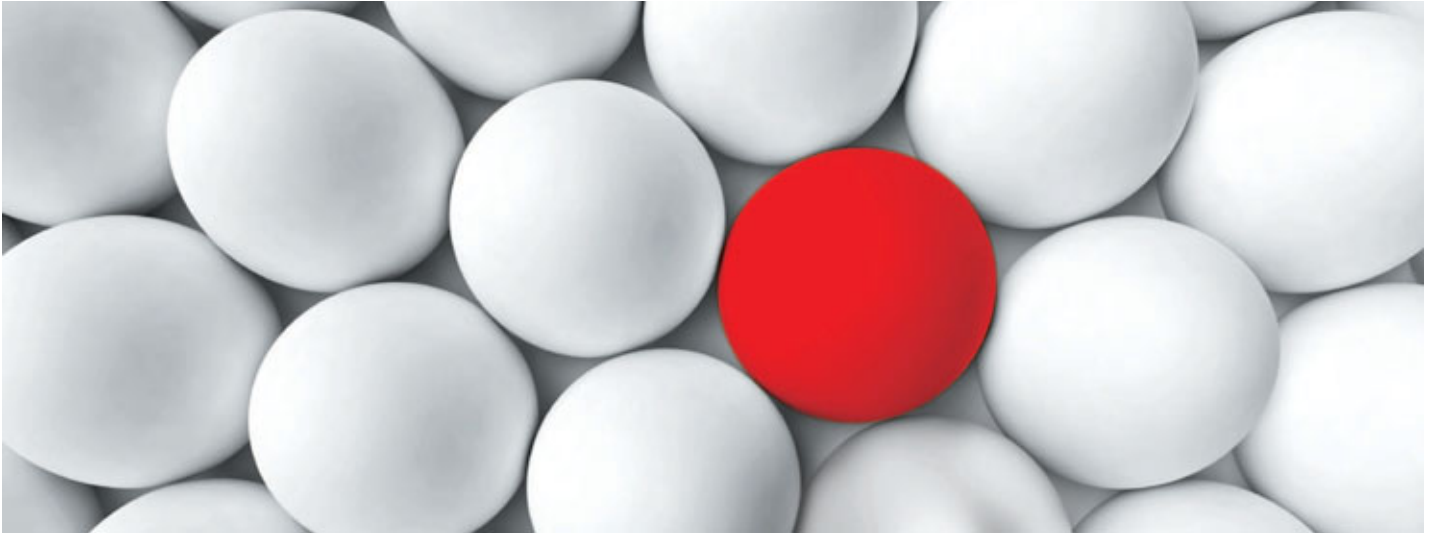
When Ashton returned to Utah in 1955 with four children to feed, he went to work for his father as an engineer in the heating and air conditioning business. Jed Ashton hoped like many fathers successful in family business that posterity would preserve his hard-earned legacy, that his eldest son would inherit the business and make a go of it.

"I was one of those kids who made balsa model planes," Ashton reflects, with not even a tinge of regret for following his own bliss, something his father also probably taught him. "I wasn't very good at it, but I've always been interested in aircraft and the aerospace business. In fact, this is jumping ahead a little bit, but there was a time when my partner and I, when I returned to California, would look up in the sky, see a Boeing or Douglas plane and hope that one day we'd sell \$5,000 worth of parts for each of those planes."

Ashton would far exceed that humble goal. He worked for his father only a few years before the wild blue yonder once again reignited his adolescent passion for aerospace. Early in 1959, with the cold war getting colder, he went to work for Hercules. At the time, the famous powder company's Utah facility just west of Salt Lake made nitro glycerin-based explosives for Kennecott Utah Copper, the world's largest open pit copper mine. Hercules had recently been selected by the U.S. Navy (and eventually the U.S. Air Force) to make rocket propellant so "they were hiring like crazy," Ashton recalls, mostly because the company also saw an opportunity to expand. Rocket fuel led to motor cases, and motor cases led to Hercules' 1959 acquisition of Young Development Laboratories in Rocky Hill, N.J.

The laboratories are one of those seminal stories in the history of composites. As Ashton remembers it, the British-based M.W. Kellogg, an engineering think tank involved with the Manhattan Project, is where Dick Young started "playing around" with spools and resins. Widely recognized as the father of modern filament winding, Young in 1946 patented the fabrication of fiberglass-polyester rocket motor cases while working for Kellogg. The U.S. Navy awarded the company a contract the following year to produce winders. Eventually, however, Young purchased the winding machine from

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Kellogg and started Young Development Laboratories.

That summer of '59, some years later, Hercules sent a team of engineers that included Ashton to Rocky Hill. "We acted like quality control spies and learned as much as we could," he remembers with fondness. "They were making the Minuteman there, and I worked in the quality control department. Between three of us, we covered 24 hours of operations. That's where I got into the filament winding end of it all."

Not just to create technology, but to constantly improve it, to challenge the status quo, which gets risky. After he evaluated the filament winding process, Ashton wrote his boss at Hercules a letter, outlining improvements. The letter made its way to Dick Young, who stayed on after the Hercules acquisition to help manage the Minuteman project. Young took quick note of Ashton's insightful observations and enthusiasm for filament winding. The two became close friends.

"He was a typical example of a guy who started out being hands-on, a know how to do it type person, an inventor if you want to call it that," Ashton said. "He had his own plane, and whenever he and his wife used to fly cross country, they always stopped in Salt Lake to visit.

Several hundred yards from the labs sat Dick Young's "gingerbread house." Ironically enough, as Ashton is quick to make light of, many of the components were filament wound fiberglass.

"The eaves, gutters, window sills, it was really crazy," Ashton says, the spark of reminiscence in his eye, a big smile across his face. "A lot of the house consisted of long sections of tubes. It was funny because he used a Shell resin, something like a Shell hardener Y and it cured a nice pale green color. But it was epoxy and epoxy weathers badly outdoors, exposed to ultra violet light. So it kind of all went to pot."

The years passed. Dick Young retired. Throughout their long relationship however, Young always encouraged Ashton, first by prodding him to go into business for himself. After his stint at Hercules came to an end in the early 60s, Ashton did just that, and his real passion for filament winding began.

Ashton cocks his body back and pushes himself off the couch in his office. "Let's go to lunch," he says. "When we get back, I'll show you around the shop."

We climb into Ashton's Subaru sedan with Program Manager Tammy Christensen and head to the local sandwich shop. The sun has

circled higher in the sky, the mountains fall back and no longer cast mystery across the landscape. It's all right here now in front of everyone plain to see. Energy levels pick up, pose questions about obscure circadian accents and how engineers and inventors come up with ideas. Ashton is energetic, witty during the drive.

His last year with Hercules is when he got the itch. Call it restlessness, monotony, the need to create technology, or risk. Call it creative impulse disguised as calculation like many engineers tend to do. But Ashton decided, along with coworker John Anderson, who worked in the tooling department of Hercules' Utah plant, that the winders Hercules was using, the ones designed by Ashton's mentor Dick Young, were restrictive, obsolete, and borderline mechanical nightmares even though, he points out emphatically, "they did the job."

So the two flipped on the lights after hours at Ashton Heating and Air Conditioning and used the shop to build a more expedient and coordinated winding machine. They then sent letters and sketches to the Hercules plant manager who promptly sent word back through the chain of command that the two young engineers needed to back off and stop screwing around in places they had no

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business. Point not well taken. There's the stubborn streak of will in Ashton that works to big brother the often inhibited creative idea. Ironically, he had been placed on a search committee with executives from Hercules' Wilmington, Del. headquarters to locate a winder manufacturer and a site for all Hercules winding operations. The site ended up being an old Naval storage facility in Clearfield, Utah, 20 miles from Salt Lake, and the winder manufacturer ended up being Black, Sivalls, and Bryson in Oklahoma.

As we stand in line to order lunch, I notice a paternal tone in the answers Ashton offers to Christensen's questions. They talk shop. Christensen is project manager for composite structures programs at RMC. Ashton is obviously a mentor to her. It's his most revealing role. With forced, probing eyes, he has a way of plumbing people, excavating honesty first, then their ability to break out of themselves. I can see the story of his career taking shape around this, being successful in large part, not just because of his mechanical ingenuity, but because he's allowed the hard lessons of life to mold his vision.

Word got around. Somehow, information about the winder Ashton and Anderson constructed got to a company representative at TRW in Cleveland.

"We never did get an opportunity to show it to anybody at Hercules," Ashton says with a smile back in his office. "But TRW was convinced that Anderson and I could build a machine that could wind fiberglass nozzles. So we quit Hercules, built this machine and sold it to TRW. We started ENTEC, the Engineering Technology Corporation. We were fortunate in that we were one of the first companies to build machines along with McClean Anderson."

Fortunate in large part because of one timely historical fact. The U.S. Atomic Energy Commission retained contractors across the country in the early-to-mid 60s to build weapons delivery systems. ENTEC received a prosperous number of contracts to build winders though Ashton, due to the classified obscurity of the Cold War defense mission, never knew exactly who his customers were. Bendix in Kansas City, Lawrence Radiation Laboratory in Livermore California, ACF Industries, Sandia National Labs, Aerojet in Sacramento all added up to good speculation however.

ENTEAC, Ashton's first business. He'd respected his ancestor's legacy, all the way back to his Great Grandfather Edward the shoemaker. Hard work and more hard work, the formula still applied. But modern life, unlike frontier life, had become, perhaps, less desperate, less reliant on volition, more



*A young Larry Ashton in France with a local associate.*

emancipated. What else could Ashton think that morning he went to work and was served divorce papers?

When that fateful year with the red ink through it was over—September of 1966—Ashton found himself back in California, in Long Beach, working for Okaw Industries. There was a new woman in his life, and when he returned to Utah a month later, the two got married, packed up a Buick Riviera borrowed from his new boss, and started for the eureka state.

"I'd gotten a call one day," Ashton remembers, "from this company in Long Beach who'd landed a contract with Douglas. The very earliest DC-8 potable water tanks were made out of metal. I worked out an agreement to work for this fellow, Bob Perkins. He had another partner, named Barney Weakley. We would start a new business, each of us to own a third. We'd filament wind potable water tanks with fiberglass. Dick Lyman from ENTEC joined me and we came up with some new ideas, a tooling concept for a tank that had a one-piece liner, as opposed to having to bond three separate pieces, two domes and a cylinder. We built a really simple machine and developed what is still a very standard process for fabricating potable water tanks worldwide."

Ashton regained his emotional footing enough to sense what he felt may have been unethical business practices between Douglas and Okaw. Negotiations between prime contractors and subs slipped from panic mode to corrupt overdrive, which is not his style no matter how lucrative they might turn out to be. Douglas, it was widely speculated,

faced heavy fines from airlines that loomed over late deliveries of DC-8s and DC-9s. The planes were 9-18 months behind schedule and the company, rumor had it, invited bankruptcy in the same time frame. All of this pushed the 1967 merger with the McDonnell Aircraft Corporation. The two historic aircraft giants had been negotiating some form of partnership since '63.

After being shunned on the initial offer to start a new business of which he'd have an equal share, Ashton grew tired of fabricating water tanks and took on a new project, one landed under the fast-talking pretext that Okaw actually had experience fabricating transparent canopy windows for military aircraft. These were for the B/RB-66 Destroyer currently flying in Vietnam. Apparently, the canopies were popping off in flight and the current contractor, Swedlow, already had invested millions of dollars in the project. Ashton and Lyman came up with another idea, built a press and cranked out laminated canopy windows. Like the potable water tanks, they turned a handsome profit for Okaw.

Ashton had come a long way since his senior college ramjet sizzled toward a work crew. But the unscrupulous ethos that surrounded him had taken its toll. "I went in one day and said I'm quitting," he remembers. "I didn't know what I was going to do. I went home for a week and worried about it."

Just outside his office, in a hallway that eventually connects to the shop, is Ashton's wall of fame, a trail of photographs of men he's admired who've shaped his sensibilities and helped him become, when everything else melts away, the magnanimous and imaginative engineer. He describes them as men who believed, men who were pushed by conviction into the abyss, men who thought they could change the world. Some of them also represent the right place and time for Ashton, that half understood dynamic of how the will to prepare oneself for life and career mixes with fortuity and opportunity. His brother-in-law Jim and father Jed flank the procession of portraits. Former Beech Aircraft President Linden Blue contracted Ashton after he'd started Fiber Technologies to filament wind Beech's Starship fuselage out of carbon fiber, the first general aviation venture of its kind. Charles Bates put up the money for Ashton to start Fiber Tech. Dr. Sam Williams, the father of the gas turbine engine and fan jet technology in the aviation industry, neighbor Dr. Robert Arbon, ear, nose, and throat specialist and confidant in all matters of mechanical intrigue, and cousin Robert Hales, childhood pal, former jet pilot, Harvard MBA, Max Factor Executive VP,



and now Mormon Church Apostle, are Ashton's heroes whose photos he passes by everyday. Another face behind a glass frame is Ed Dunahoo, the dearest friend, Ashton says, he ever had. And despite only being five years his senior, a strong father figure.

"Where's the guy who was building the tanks?" Ed Dunahoo asked. Unbeknownst to everyone other than Okaw's owners, he had recently bought Weakley's share in the business.

"He quit," Perkins said.

"He's the reason I bought into this business," Dunahoo replied, before asking for Ashton's phone number.

Ashton invited Dunahoo to his house in Long Beach.

"He asked me what the problem was, so I told him his partner wasn't living up to his end of the bargain," Ashton said. "Ed told me to come into work the next morning and the first thing we'd do is go out and rent a building. So that's when we started Fiber Science in Gardena, California. We brought in Dick Lyman and some other good people, always good people. And we ended up getting all the potable water tank business for the American aircraft industry, which was Lockheed, Boeing, and McDonnell Douglas. We built rotor blades for the Cobra helicopter that led to production work, not for us but for someone else. We built fuselages and landing gears for the Cobra. We had a lot of helicopter stuff because of our relationship with Fort Eustis in Virginia. We did the first survivable external fuel tank, took one of our potable water tanks and subjected it to gunfire and internal explosions. That led to development of a small, external, wing-shaped fuel tank and contracts



Ashton takes pride in his products, but also in his ethical posture toward business.



Larry Ashton with Dr. Sam Williams and Linden Blue.

with the Air Force out of Wright-Patterson."

Fast times, filament winding, an innovative culture, Fiber Science grew to symbolize success, with Ashton's gene for survivability built into every challenge. When the U.S. Air Force saw that Fiber Science could wind a fuel tank that burned for 30 minutes and withstood 23 mm Russian ordnance without exploding, the company landed a big contract. The "survivable" tanks became the standard across the military's rotor aviation complex, including the now legendary Black Hawk.

With the need to run an honest business, Ashton realized another epiphany while at Fiber Science—a need to pursue development work and prototypes, the drive to create technology. For him, there was no hidden beauty in the rolling expediency of assembly lines. He was all about "what's next?"

"Strictly a development house," he now reflects. "We'd come up with a new idea, develop it, take it up the curve of success to a certain point, and then give it up to someone else for production."

One day Ashton, an avid trade journal and magazine reader, stumbled across an article that detailed a novel sewage disposal system installed in large apartment complexes in Scandinavia. Whenever and however the creative spark ignites, Ashton enthusiastically sought out Dunahoo. "Fooled around" is the operative phrase, and Ashton proceeded to convert one of Fiber Science's Boeing 747 potable water tanks into a vacuum-driven toilet waste system.

"I bought a toilet, rigged up some clear plastic pipe, ran it around and dumped it into our tank, and when you flipped the button, the valve would open," Ashton says, smiling, demonstrating with his hands while mimicking the sucking sound. We filled that toilet with all kinds of 'crap.' Dog food, soup, you name it. We wound up inventing the vacuum flush waste system now used throughout the airline industry. Airbus and Boeing both use it."

Success of the vacuum-driven toilet waste

system, and a well-nurtured relationship with Boeing which, according to Ashton, still let its engineers do the talking in an age where purchasing departments reigned supreme, back in the day when "you still could be tight with Boeing," led to more work. Boeing had contracts to build a half-dozen elaborate private jets, converted 707s, for affluent foreign dignitaries like the Shah of Iran and Kings of developing countries. The airliner negotiated with Fiber Science to build full-scale lavatory modules for these planes—lots of fiberglass accented with gold-plated fixtures. Dunahoo had purchased a tooling company in Salt Lake, run by Kay Ruggles who'd got his start with Robert Morrison and the Corvette at MFG. The Salt Lake facility proved to be the perfect location to fabricate lavatory modules.

*So, we were in the lavatory module business and Boeing asked us to come up with a development plan for the SST [2707 Super Sonic Transport]. They had some requirements that were very different from other commercial aircraft. They wanted to turn the plane around quickly, be able to avoid servicing the toilet after every flight. You've seen the guys hook the hoses up to the waste tanks and stuff splashes all over? Plus they had tight restrictions on where to put the stuff, and they didn't want to install big tanks. They wanted something new, so, I'm almost embarrassed to tell you this, I came up with an idea. We were going to come up with a system that eliminated 90 percent of the waste and consolidated the rest of it. We'd have a filter that separated out the water and routed it to the engine where it would burn off and the remaining 10 percent of waste would be extruded into a solid block. So, we were on our way to Boeing to present our idea, working on the details on the plane when a stewardess walked by and asked what we were doing. We explained to her the project and she was pretty interested. When it came to the solid block part, I pulled a Kevlar laminate out of my briefcase, handed it to her, and told her, this is it when it comes out. We all had a great laugh. Probably*

**Create technology, create technology, create technology—Ashton's mantra, so he resigned over the dispute, more over his marching orders to never engage customers directly again. It did not fit his interpretation of honest business and trust. He returned to consulting.**

*the greatest thing that ever happened to me was that they cancelled the SST. — Larry Ashton*

“Am I boring you?” It's a sincere question. I check myself. Do I appear tired? Did I yawn?

“Not at all. It's what I came for.”

In some ways, I can't believe Ashton asks me this. But I guess it can be hard to measure the value of one's contributions when confined to the “inside.” Mundane details can come to obscure big picture context and objectivity, and statements like “we were the first to do that” sometimes come off as questions.

By now Ashton's oldest children are ready for junior and senior high school. It's the mid-70s, halfway into a new decade, and going

home again presents itself as it sometimes does with new confidence, even as the past fades to a question mark. He'd been in Long Beach with Joan since 1966, and the couple had always tossed around the idea of returning to Utah. Besides, Ashton was feeling compelled to have an occasional look over his shoulder. Young and successful can many times provoke an unsuspecting bull's-eye to appear on a company's back. And sure enough, Fiber Science soon found itself in the crosshairs of the EDO Corporation, which squeezed the trigger and paid for its acquisition with restricted stock that, according to Ashton, decreased in value. He lost money on the deal. Over the years he watched EDO's potable water tank business increase. But

volume production isn't for him anyway.

Prior to the acquisition, Larry and Joan returned to Utah to visit Joan's mother. Just northeast of Spanish Fork, through the windy alpine passes of Joan's hometown of Mapleton, a for sale sign on a house jumped out like a lost trailhead in a winter storm. They must've had the same thought at the same time. Larry pulled the car over, and they knocked on the door. Something clicked immediately. Then, after a few weeks, insecurities set in. They debated the pros and cons before instincts guided their decision to buy the house. Ashton told Dunahoo who advised him to set up a consulting business in Utah, Ashton Engineering. There were consulting contracts with Sikorsky Aircraft, rotor heads and blades for helicopters. A year later, in a surprise move that involved divorce and remarriage, Dunahoo moved the entire Fiber Science operation to Utah. By now, however, Ashton had become friends with another man who occupies a place on his wall of believers—his neighbor, Charlie Bates.

Dunahoo and Ashton made an agreement prior to EDO's buyout not to compete. Ashton would “stay out” of Boeing and Dunahoo would not market to McDonnell Douglas.

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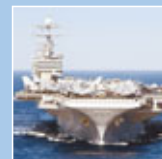
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“He was as interested in my success as he was in the success of Fiber Science,” Ashton recalls. “He was just that kind of a guy. Now Charlie Bates used to have a company called ValTek that made high pressure, automatic control valves. He sold it for millions. He put up the money and guarantees in 1977 for a new company, Fiber Technologies. So we started near Provo in a little factory that Charlie had used to start ValTek.”

Portable water tanks for Douglas, engine nacelle work for Rohr, and a significant program with the Army to build a deployable, carbon fiber bridge, Fiber Tech started to grow. Ashton also built filament winding machines for Union Carbide.

Bates proved to be an excellent business partner and the company hummed along for several years until the bull’s-eye reappeared on another business Ashton built, this time through the sights of California-based TRE (Tool, Research, Engineering) and a man named Leo Wyler who made a career buying companies and building empires. Ashton and Bates did well, didn’t get wealthy, but did well. Ashton, whose third eldest son Bret worked out in the shop, stayed on at Wyler’s urging as president to help run the business. The company picked up significant contracts from McDonnell Douglas and Rohr, and a “wonderful” honeymoon ensued until one day Ashton was invited to present a proposal on carbon fiber composite control surfaces to Douglas officials. Much to the chagrin of Wyler, Ashton, the consummate engineer, launched into the pitch with details on manufacturing processes. It was Ashton’s style to engage the customer, answer questions, and it apparently worked well enough to build two companies worthy of being tracked as meal tickets for larger predators in the early 1980s’ mix of aerospace contractors. Wyler’s approach to business, however, proved more cynical, or, at least, more protectionist. He believed any appearance of disclosure was exposure, a sign of vulnerability, and subsequently told Ashton as much in not too friendly terms.

“I didn’t disclose anything,” Ashton remembers telling Wyler after the meeting. “‘From now on,’ he told me, you do your developing but I don’t want you talking to the customer.”

Two approaches, two successful contrasting styles revealed and inevitably charged with conflict. Create technology, create technology, create technology—Ashton’s mantra, so he resigned over the dispute, more over his marching orders to never engage customers directly again. It did not fit his interpretation of honest business and trust. He returned to consulting. Bret was fired



from Fiber Tech. Chief Engineer Roland Christensen left and formed a composite prosthetics company. Change like this, which sometimes seems more about egos than business, is not uncommon.

In the 80s’ era of hostile takeovers, it wasn’t long before TRE also found itself with a target on its back. Wyler didn’t want to have the company split up and sold off, so he eventually packaged a deal for Alcoa some years later, which unloaded Fiber Tech after only a half-hearted try at composites.

“They just dumped it,” Ashton said. “Didn’t sell it or anything, just locked the doors.”

The aluminum giant decided to refocus on its core market. Many of the managers who remained after Ashton left, who had shares of TRE stock, benefited from the sale to Alcoa, but Ashton wasn’t one of them. When he thinks about how the golden umbrellas popped up, he’s quick to point out in his reflective and generous way that he has no regrets, that, for the long run, he’d made the right decision to leave.

But before Ashton resigned, before the dispute with Wyler, Fiber Tech took on a project that significantly influenced Ashton’s ideas about airframe technology and the kind of work he’d eventually pursue at Rocky Mountain Composites.

What did he think up there around 25,000 feet, before the two turbo-prop, Beech King Airs approached the Provo City Airport? Linden Blue left his position as Vice President of Leer Jet to take over as President and CEO of Beechcraft. Faced with a formidable but seductive challenge, Blue intended to break new ground, to re-engineer and fabricate a new FAA-certified aircraft with advanced composite materials and innovative processes. He’d made stops already at several of the world’s largest aerospace

manufacturers, met with top engineers, and apparently came away unconvinced that his vision could find more focus.

“They all got off the planes, the vice president of this and the vice president of that, about eight to ten guys,” Ashton said, smiling. “They wanted to know if we’d be interested in building a fuselage for a new airplane they were developing. Well, of course we were interested.”

Blue formed a team that included Burt Rutan (see September, 1998, *Composites Fabrication*). They conceived an all-composites plane called the Starship and fabricated a 60 percent scale model. Ashton thinks Rutan’s fervor for composites heavily influenced Blue’s decision to wind the fuselage. Code named “Seagull,” Fiber Tech built the first seven as excitement grew for the project. Wyler approved construction of a new building. Ashton’s combined genius for aviation and filament winding reached an incorrigible self-actualization that even the later fallout with Wyler and his departure from Fiber Tech could not dampen.

Project Starship, however, proved short lived in the volatile world of aerospace contracting. After co-founder Olive Ann Beech died in 1993 at the age of 89, Raytheon purchased Beech and moved all operations to Wichita where the balance of the 50 Starships were manufactured. Linden Blue went on to found Cardiff by the Sea, Calif.-based Spectrum Aeronautical, posting brother Austin as president.

But the Starship and its radical all-composite fuselage left a profound impact on Ashton, Blue, and the history of composite aircraft structures. When Ashton took me on a tour of RMC, past winding machines and autoclaves, through a set of doors into a high bay area, there sat the direct legacy of the Starship being wired for its first test flight scheduled one month out. The sleek

Spectrum 33 with its filament wound fuselage, a light-weight, 6-9 passenger joint venture between RMC and Spectrum Aeronautical, was a “conspiracy” of sorts.

Five generations removed from his great-great grandfather Edward, Larry Ashton's oldest son Bret has all the savvy and experience necessary to follow in his father's footsteps. For years he watched, soaked it up, keenly understood, learned to imitate. His father's ingenuity is *the commodity, the principle resource* on which all success turns, he learned.

As the dust settled after the rangle with Wyler, Larry Ashton revved up his consulting network and Bret, who had a degree in Business from the University of Phoenix, secured free use of a warehouse in Springville, just north of Spanish Fork, where he started a new business appropriately named Winding Technologies. Free because the warehouse also belonged to Charlie Bates and had been used by ValTek. Directly across the street, in plain ironic view, however, sat another plant expansion—Fiber Tech and TRE's foray into Beech Aircraft.

Fear of a lawsuit from Wyler kept the senior Ashton on the outside of Winding Tech, but he consulted with his son along with other aerospace contractors, including Sikorsky. After Alcoa scooped up TRE, however, Ashton dove in and helped build the start-up into a viable business. He also had close friends at Shell who were interested in backing the venture, initially kicking in 17 percent followed by an agreement to increase Shell's share 10 percent annually.

“They owned us,” Ashton said, chuckling. It got up to 37 percent or something, but they put a lot of money in. One of the things we did, with the encouragement of United Airlines, was build a second generation toilet waste tank

because of the problems in the quality of tanks being delivered from Fiber Science.”

With DuPont at the top of the customer chain and a supplemental sub-contract order for C-17 troop doors, and despite disruptive interest-jockeying between DuPont, United, and Boeing, Winding Tech tracked the same confident curve on the growth chart as Fiber Science and Fiber Tech. But Ashton knew his one-off, prototype development habit would need to be fixed with steady volume production, so he remade Winding Tech into AeroTrans. One half of the new venture focused on aerospace, the other half on transit, specifically, the emerging railcar business. To run the “trans” side, Ashton brought in Norm Van Skyhawk, who worked with Kay Ruggles, and McDonnell Douglas Tulsa Vice President Roly Huntsman who previously worked for Bombardier. Huntsman had learned railcars after Bombardier acquired the famous Pullman company in 1987.

Amtrak Superliners, Getty Museum cars, Disney monorail, the transit side of the business soon outpaced the aerospace side, but not enough to keep major investor Shell impressed. The company divested and sold its share to venture capitalists who reinvested in AeroTrans and moved all railcar manufacturing operations to Salt Lake. The market got hot, a fact not lost on neighbor Alcoa and Fiber Science, which lured away several top engineers from AeroTrans in an effort to compete for contracts. Several head-to-head contests wound up going Alcoa's way, a whole new line of Amtrak cars and components for the San Francisco Bay Area Rapid Transit System (BART). AeroTrans' profit margins started to dwindle. To keep investors happy, Skyhawk dove into the marine industry, launching production of an 18-foot hybrid runabout. “It was a beautiful boat, a

great concept,” Ashton recalls. “Two jet skis could run up and be loaded on docks in the stern. They made a great product, but didn't market it very well. I think they sold about 50 boats and then sold it off to a company down in Florida.”

Now in real financial straights, the venture capitalist group moved to spin off the aerospace division of AeroTrans and offered Ashton the opportunity of full control in exchange for his employment agreement and the cost of assets. It was 1995, the Cold War and the big aerospace mergers and acquisitions of the 80s were over. There were only 15 employees in the “Aero” half of AeroTrans, ten of which chose to follow Ashton into a new venture he called Rocky Mountain Composites.

*To wind is to wrap, to encase, enclose, encircle, entomb, to adduct, bring toward and around. There is no pushing, only pulling, spinning and spinning and spinning. And wrapping makes it all stronger, fibrous layers accumulate in a series of returns, like an oak that ages to hard wood, like the history of a religion, a city, a family, an industry, a career that conspires to find all its points around the happenstance of time and energy.*

Scrawled across a photo of the Spectrum 33, Linden Blue, who has logged more than 10,000 miles as a pilot, endorses his friend and fellow visionary Larry Ashton with this address: “To Larry, my great friend and inspiration for many years. I think we have done it right this time and I look forward to the next 20 years of still more conspiracies.”

Rocky Mountain Composites built its reputation around its founder's vision and his hunt for the Holy Grail of composites manufacturing technology. In a partnership



Ashton (left) and the RMC crew, like family.

that supports that search, discoveries of which have since been invested in the Spectrum 33, Linden Blue owns a majority share of RMC. Blue's days at Beech and the Starship team's reach for an all composites business class aircraft, and Ashton's love of aviation and endless quest for technology, have found that sweet confluence that can change history, personal jokes of conspiracies not without standing. But turbulence, as well, is not without its mystery and chaos. In late July, the Spectrum 33 prototype crashed on takeoff killing both pilots, Director of Flight Operations, Glenn Maben and Spectrum Vice Director, Nathan Forrest. Apparently the controls were improperly rigged after a redesigned aileron V-bracket forced a portion of the translation linkage to be removed. This reversed roll control. Left roll input from the side sticks produced, instead, a right roll.

The ultimate loss. A tragedy of no fixed proportions. But to not continue would dehumanize innovation, mechanize chance, make the enlightened version of success more linear, not less. Structurally the Spectrum 33 is sound. Information gathered from prototype test flights puts it on track for FAA certification in 2010. The project is not cursed. Just like the Apollo 1 launch pad fire that killed

Virgil Grissom, Ed White, and Roger Chaffee did not prevent Neil Armstrong, Edwin Aldrin, and Michael Collins from landing Apollo 11 on the moon, the Spectrum 33 will have its story. And it'll be a story of right brain thinking, teamwork, and vision. One of the main characters is *fibex*, a trademarked, high performance, carbon fiber material invented by Ashton and his crew at RMC. A one-piece fuselage, one piece wing and empennage, a spring in the main landing gear, the versatility of *fibex* will allow even lighter performance loads and higher operating efficiency for the Spectrum 33, which, with two Williams FJ33 engines, will reach Mach 0.72, cruise at 45,000 feet, and have a take off weight of 7,300 lbs. "Precision, integrity, simplicity" goes the motto on the marketing literature.

*The first house Edward Ashton and Jane Trebarne lived in, only had one room, and their furniture consisted of a small cooking stove, a large box for their table, two smaller boxes they used as chairs. Their bed consisted of four posts with a three-by-four timber nailed in between the posts. The timbers had wooden pegs, about eight inches square, and from these pegs, a small rope was stretched back and forth across them. When the sides were completed the rope was then put on these pegs from head to foot by this*

*method. It made eight squares each way. On this rope spring, a tickling filled with corn shucks was laid ....* — From the diary of Emma, Elizabeth, and George Ashton, 1930

From the Rocky Mountain Composites website, one paragraph on the company history page starts with, "From humble beginnings ..." In many ways Larry Ashton still sleeps on a corn shuck bed. His father had been trained to fly in Texas by the U.S. Army Air Service—the Curtiss JN Jenny biplane—but WWI ended before he saw service. Family history, the Mormon Church and either shoe making or composites technology—time and risk returned the Ashtons.

After the interview, in the Jeep Cherokee parked on the RMC lot, I sit and scribble notes late in the Utah day. The Wasatch Mountains are closing in as the sun descends and the already chilly air slows for night. Winter hovers behind those mountains like an abstract thought. How do corn shucks become extremely fine carbon fibers dedicated to circular motion? **CM**

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### ***("Composites Character..." from p. 38)***

are made, we have suggested that *ethics are the result of a process based on principle*. It is a process by which decisions are made. When the basis of the process is understood, then the moment to moment decisions can be made to be consistent with principle that is the basis of the process.

In this regard, then, the process of building character is very much like the process of making quality decisions in a manufacturing process. We can have rules for administering quality, but ultimately the rules must be based upon some underlying principle such as "Keep the established rules that create good quality;" or "The product must be good enough to meet its intended life;" or "Ship only product that delights the customer." These three examples of rules are somewhat different and will cause different actions to be taken in deciding on the quality. However, because they are based on principles, each will provide its own consistency in the decision process. To restate the principles for each example more generally, the basis of example one is "Always keep the rules;" in example two it is "Always maintain product integrity;" and in example three, "Always serve the customer."

Another point to make is that quality is best controlled by controlling the process. The best

way to get quality is not just by inspection (100% testing), nor is it by just monitoring the process (SPC), but it is best to have a "target-centered manufacturing process" (where the principle is "reduce variation") that is enhanced by seeing the entire enterprise as a whole and then working hard, continuously, to see the future and control all aspects of the manufacturing process.

By analogy, character is best accomplished by having a strong ethic but seeing it in the light of the entire philosophy and climate of the company and according to the underlying basis on which the company does business.

Remember that developing strong character is a continuous process based on a strong ethic, much like quality. The basis should be established with careful thought and in light of the vision and values of the company. Then, some reasonable methods should be established to implement the decisions that are made most often. But the most important part of the process, the part that will really make a difference, is the articulation of the basis for the decisions because that basis will help all your employees and yourself make more consistent and satisfying ethical decisions.

In summary, the composite of our character means establishing a sound basis for

life in terms of rule of laws elements such as specifications, codes, or rules. But while these laws, codes and rules have their purpose, they fall short of having sufficient depth and meaning to more fully develop integrity, courage and wisdom – in short, our character. In a time when fundamental ethical principles, high moral standards, sound philosophy, and sound traditional values are being challenged, and in some cases abandoned, the lessons of the composite of character establish a basis and justification for building and maintaining excellent companies and people. To incorporate the method, one must 1) properly seek and define the target value (define the fiber); 2) fully develop a sense of conscience, courage and correct actions (matrix); and 3) be prepared to remain true to the target when others propose returning to specifications (commitment). **CM**

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