History of Holcombe Industries & Maravia

By Herm Hoops ~ 2015 (Revised 2017)

In 1972, Richard Nixon entered his second term as president, the Dow Jones hit 1,000 for the first time, and Don McLean's song "American Pie" reached number one. On rivers, surplus military rafts ruled the waves. In 1972, spurred on by local river runners inventor Gordon Holcombe founded Maravia to use his expertise and knowledge of new high-performance materials to build a better boat. It was the start of a partnership with customers and the beginning of a 43-year river trip.(1)

Gordon Holcombe was an incredible inventor and manufacturer, and he was instrumental in the early production of one of river running's most iconic inflatable boats - the Havasu. Gordon may not have been the best businessman, but if he said he was going to build something he made that happen because he never had a problem finding investors to invest money into his projects. (2,3)(#a.)

Holcombe, a Californian, had worked with the Switlik Parachute Company prior to initiating his Holcombe Industries in California. The key players in Holcombe Industries were Gordon Holcombe, Chris Pearson and Richard (Dick) F. Ford. Bob Ford, Dick's father, and the Ford family were from the California Bay Area but they had made a considerable amount of money, in Venezuela working for big oil companies. Bob's son Dick was an engineer, and when he moved back to California he was the primary financier of Holcombe Industries. Dick Ford became the administrator or CEO of the new company. Chris Pearson came from a sales background selling tires for the airline industry, so Chris became the company's sales manager. Holcombe knew manufacturing and design and he was in charge of production.(2)(#f.) Gordon Holcombe had hired a husband and wife team that worked for him for years at Holcombe Industries, and a company known as Redwood City inflatables. They moved to San Leandro, California and by late 1972 the company began manufacturing products.

Some of the early items that Holcombe Industries made were floatation devices for torpedoes, giant submarine covers, aircraft escape slides, and very large inflatable swimming pools.(#c.) Holcombe had been manufacturing military and aircraft items like escape slides and life vests. By 1975 Holcombe Industries had named its division that manufactured inflatable line of whitewater crafts, dinghies and transom boats Maravia.(4) The name Maravia was born of natural elements -water and air - named for Marine and Aviation .(2,8)(#e.) They began production in a warehouse not much larger than a garage adjacent to a large electrical plant where Tony Aragon worked. The plant had several unused bays and Maravia rented them. Tony's son George was looking for work, and Gordon Holcombe hired him to help with the move and in 1973 George Aragon began working for Holcombe Industries.(2,10)(#d.)

{Numbers in parenthesis (1) are REFERENCES; Letters in parenthesis (#a) are described in SIGNIFICANT NOTES.}

When Maravia was formed they didn't really have one main product to produce. They had manufactured chemical light sticks, inflatable life vests and aircraft escape slides.(2)(#e.) The curved escape slides they had been building reminded Gordon Holcombe of the tubes of military inflatable rafts.(8,30)(#ad.) It led the team of Dick Ford, Gordon Holcombe and Chris Pearson, with over fifty years of combined experience in the design and manufacture of sophisticated aircraft-related inflatables, to move into the inflatable boat industry. Maravia abandoned conventional inflatable boat design and manufacturing techniques to develop their own new methods. They set their goals on producing an American-designed, American manufactured line of inflatable boats that were superior to the traditional boats manufactured in Europe. The company continued to manufacture products for the airline industry and government as the new inflatable boat business developed as a spin-off company and Maravia, was formed.(2,8) After five or six years at the warehouse in San Leandro the company expanded its facilities to Oakland near the Oakland Marina.(#g.)

Around that time Vladimir Kovalik began coming around the San Leandro shop and became friends with Gordon.(2)(#h.) It may be that Gordon Holcombe and Vladimir knew each other from their days working for the Stanford Research Institute (SRI). Maravia, a part of Holcombe Industries, had been designing some inflatable boats. They had been asked to build some 18' and 25' boats with 24" to 30" tubes for a Grand Canyon outfitter. One of the boats they tried to build in the very beginning was a boat that Gordon had patterns for, what he called the Havasu. It was a rounded boat, the seams went around, and the sections weren't mitered.(2) Many feel that it was the combination of Gordon Holcombe and Vladimir Kovalik that designed and produced the first lace-in, inflatable floor.(6)(#ae.)

For years Maravia cut fabric with scissors and electric knives on a large cutting table where patterns were laid over several layers of fabric and cut out. Then the boats would be laid out and built. One of the original employees was Ivan Swikard who was a sheet metal design pattern drafter who worked on ships and for several other companies. Swikard and Holcombe were about the same age and became good friends. Gordon would come up with ideas and shapes, and Ivan would lay them out in patterns. He knew how to make tapered curves, like the barrels of big cement trucks. Ivan was an important part of Maravia's development because for years he designed all of the patterns for the life vests, the inflatable aircraft escape slides, and rafts using a slide rule.(2) When Ivan was older he told George Aragon, "I'm not going to be able to do this for very much longer, I would love for you to go to math school so I could teach you. Aragon had developed enough experience to look at the proposed design and make patterns. George said, "It would take me a few tries but I could lay them out." After Ivan was gone Aragon took over the pattern design.(2)

By the mid-1980s Chris Pearson had left and Gordon Holcombe had passed away. By 1984 George Aragon was heading up production. Dick Ford and his brother Phil Ford were running Maravia. Their father Bob felt that his sons were not working hard enough and the company was falling apart.(2,3) Bob Ford told Aragon, who was managing the company if he could find investors he could buy the company. George said: " I don't think anyone expected it, but, I was able to go out and find some people who were interested in purchasing it."(2,30)

A group of Portuguese women were building the rafts. The women were wives of men working at a plant in San Leandro, so when Maravia was moved, they bought a van for the women to drive across the bay to work each day.(30) In a chance encounter Aragon had approached two of his Idaho friends, Doug Tims and Mike McLeod, about investing in Maravia.(2)(#j.) In 1985 the new team of Maravia became Doug Tims as the CEO, Mike McLeod as the National Sales Manager and George Aragon as the production manager. On Thanksgiving of 1985 Maravia moved to Boise, Idaho.(2, 30,31)

In 1986, Microsoft went public, the Space Shuttle Challenger tragedy claimed seven lives, and Greg Lemond became the first American to win the Tour de France. Maravia busied themselves in solving a long-time rafting problem: glued seams. This was the year Maravia pioneered Thermofused™ seam construction, which eliminated the problems caused by cold-glued seams.(1,2)(#v.) A pivotal event in 1988 occurred when the U.S. Navy gave Tims a contact who used spray urethane which developed into the next advance in raft construction.(8)(#s.)

The original Maravia dealer was Ron Mattson's Cascade Outfitters. Cascade was originally a welding shop, owned by Mattson, that made Cascade frames and trailers. Mattson was also a river runner who became involved with the Yangtze Expedition in China.(2) In 1985 Maravia made five or six custom-made boats for Cascade Outfitters and Cascade donated the boats to the Yangtze Expedition because Mattson was on the Expedition. But because of the abandonment of the Expedition and most of the gear, and the untimely death of Ron Mattson in a bicycle accident, Maravia was never paid for the boats. "When Maravia was sold to Doug Tims, Mike McLeod and George Aragon, the Ford family said one of your jobs George is to try and get money back that we never got paid for. One way was to sue Ron Mattson, but Ron had always said, George I'm going to work hard to get you that money. I said you know Ron we're getting cheated out of fifty-grand and that was a lot of money back then. And a bunch of that was my personal money. Then Ron was killed and it just drifted."(2)

Even though Cascade sold other boats, Maravia was always sold as their premiere boat and that seemed to be changing. By 1997 Maravia bought Cascade Outfitters because it seemed like a good business fit. After purchasing Cascade Outfitters, Maravia moved the operation to its Boise location, where it operates as an entity separate from Maravia. (2,30)(#l.)

As Maravia developed and refined its whitewater inflatable designs the company began to be recognized for its innovative designs. They were making Kevlar boats in the 1970s, and they tested a drop stitch, self-bailing floor in 1984 and marketed them in 1985. The floor was four inches deep and initially laced in through grommet holes.(2)(#p.)

Maravia had a reputation for good-looking rafts that performed well, but over time they developed seam leaks. After Mike and Doug bought the business they began efforts to solve the seam problems they faced. The problem was a manufacturing innovation the previous owners had developed where the curved sections of the raft tube were laid out on a sheet of fabric.(30)

Instead of cutting out the material between the sections and re-joining the sections together, they folded the excess material inside the raft tube and glued a seam tape over the outside to hold it together. Over time the sharp edges of the folded fabric developed small leaks that then traveled under the seam tape, often emerging inches from its source. In addition the glue that was being used was not holding up well to hot environments.(30)

So the team set out to find a better way to make seams and a better source of glue. Mike took the lead in researching how other industries were joining coated fabrics together. At the 1986 Industrial Fabrics Association International trade show in Boston they met Al Miller from Ohio who had developed a new hot air welding machine. The machine was a revolution in making straight seams, but Al had never tried joining "opposing curves" that were critical when joining the mitered sections of a raft tube.(30)

Back to Boise George and Doug took 18 panels of a Williwaw raft to Al's shop in Ohio to see what he could do. Al put the sections together in about 45 minutes, a task that would have taken all day with glue, and there was no glue involved. Mike and Doug traded a six-day trip on the Middle Fork for Al and his family for one of his new machines. Today Miller Weldmaster is run by Al's son and is an international leader in coated fabric welding technology. Their machines are used by all raft manufacturers who make boats with plastomer coated fabrics.(30)

In 1988 the drop-stitch floor was increased to 8 inches in thickness, and the bond strength between the drop-stitch and floor covering was increased four-fold since 1987.(7)(#p.) In 1988 Maravia had a banner year with record sales, 68% over 1987. To meet the demand Maravia expanded its plant twice to 20,000 square feet.(7)

In the late 1980s Maravia began experimenting with urethane coatings on their boats. In 1988 Tims received a call from Frank Branch who ran the U.S. Navy inflatable boat procurement operation. Frank had heard about Maravia's welding process and wanted to see what they were doing. The Navy was having problems with the seams on their Zodiac inflatable assault boats (CRRC - Combat Rubber Raiding Craft). While at the plant Tims told Branch that welding had revolutionized how rafts were built, but Maravia would really like to come up with a way to replace the labor-intensive process involved in gluing sheets of fabric onto the bottom of rafts to make them thicker. Frank gave Tims the name of the maintenance chief for Seal Team One out of Norfolk, Virginia, who was working with a Virginia company called Technical Urethanes to paint urethane on the bottom of Zodiacs. Putting urethane on Hypalon or other rubber-based fabrics is problematic. Maravia's raft tube was made of PVC coated fabrics and urethanes and PVCs are both plastomers, or plastic based and compatible.(30)(#n. & #s.)

Technical Urethanes built huge bumpers to protect docks from large ships putting in. To make the bumpers they start with a core of foam that are hung in large racks and rotated while being sprayed with urethane, building up a tough, outer surface. Maravia adapted this idea to hanging the main tube of a raft with all its attachment points (d-rings, grommet strip, thwart attachments) already in position and spraying it with a top coat of urethane. Since the entire body of the raft is covered in one continuous coat of urethane Maravia called it "seamless encapsulation."(30)

By varying the spray pattern, the bottom of the raft could be made thicker and they could also add a texture coat to the top. It was nothing short of a revolution in raft construction. There are no seam tapes, d-ring patches, grommet strips or thwart attachment edges exposed, so no maintenance is required on these critical components. Maravia also developed a logo system that used computer-generated stencils to apply contrasting colors of urethane in just about any design. The logo is applied the day after the main tube has been coated while the urethane is not fully cured, creating a permanent logo. The end result has been dramatic improvements in longevity and toughness in the boats. Combined with better base fabrics with incredibly high tear and puncture resistance, Maravia manufactured fleets of high use commercial operations that run the boats for 15-25 years and more.(15,16,19,30)(#s.)

When Maravia began the boats were made of PVC with a nylon woven base. Maravia went back and forth between the nylon woven base fabric and a polyester woven base fabric, but they stayed with the PVC Coating.(#n.) Gordon Holcombe had struck up a relationship with Norm Seaman, the founder of Seaman Corporation fabrics, many years before he started Maravia and Maravia has purchased its fabric from the Seaman Corporation from the very beginning.(2)(#o.)

In 1989, the Exxon Valdez ran aground, a destructive earthquake rocked California's Bay Area, and Maravia combined Thermofused™ Seam Construction with Urethane Seamless Encapsulation.(5)(#w.) About this time Maravia designed its unique thwart attachments.(#t.)

Since the early 1980s the "Wind" Series raft drawings were done by Michael Larson, a college student, who was the in-house draftsman. In 2012 Maravia hired a design engineer who has taken boat design to another level using a large Computer Aided Design (CAD) table and programmable cutter that uses a blade to layout and cut of fabric.(2,28) Using Thermofused™ Seam Construction and Urethane Seamless Encapsulation the boat is assembled, seams taped and the boat checked for air retention. D-rings, handles and other accessories are applied to the skeleton boat. Then a latex solution is applied inside of the air-holding chambers prior to encapsulation and then the chambers are drained, removing any moisture from inside the chamber. The boat then receives multiple coatings of urethane. The urethane is removed from metal accessories and the valve caps are replaced.(1,2,4,28)

Maravia started out using the PAM valve. In about 1989 they changed to the "Advanced Design 1" or AD-1 valve produced by Aztec. In 1994 they switched to the "Advanced Design 2" or AD-2 valve also produced by Aztec. In 1999 Maravia began using the Leafield C-7 valve and they continue to use that valve today.(2,28)(#r.) Maravia uses a drop-stitch, self-bailing floor without a pressure relief valve (PRV) unless a customer requests a PRV. The top and bottom of the flat floor are connected by thousands of vertical nylon threads per square foot that provides incredible strength. When inflated it results in a flat, very hard floor.(#p.) Standard equipment includes heavy duty d-rings, handles, inflatable thwarts and tarp. Maravia has a ten-year warranty on workmanship and materials.

In the early days Maravia's whitewater inflatables were named after winds.: Williwaw, Santa Ana, Hurricane, Chubasco, Cyclone, Tempest, Mistral, Elan and Esprit. They made the Cats Paw and 12' Breeze yacht tenders. While adding new lines the company continues the "Wind" tradition, from the smallest boats to the biggest ones: Cats Paw, Breeze, Bora, Zephyr, Tempest, Elan, Esprit, Williwaw I, Williwaw II, Santana, Scirocco, Mistral, New River, Chubasco, and the Chinook. They also made the Ranger and Grand models and the New River model for Jon Dragan of Thurmond, WV.(2)

Model - 1980	Length	Beam	Tube Diameter	Wt.	Capacity
Elan	12'	5'9"	17"	70#	1200
Esprit	13'6"	6'	18"	95#	1500
Williwaw I	14'3"	6'8"	20"	110#	2700
Williwaw II	15'6"	7'6"	22"	105#	2700
Santana	15'6"	7'4"	21"	102#	2650
Mistral I	17'6"	8'	24"	150#	3500
Mistral II	17'6"	7'6"	20"	120#	3200
New River I	18'	8'	24"	150#	3500
New River II	20'6"	8'	24"	170#	4200

At one point Maravia wanted to get into the inflatable kayak business. Doug Tims and Mike McLeod went to Grants Pass, Oregon and bought a small inflatable kayak company called R&R Outdoors. R&R Outdoors was owned by Greg Ramp and his father Lem Ramp. Greg and Tim Schultz ran R&R and came up to Idaho and helped get that project off the ground, working for Maravia for a year or two. Greg Ramp left Maravia after two years and started AIRE.(2)(#t.)

Maravia does not make paddle boards because most of the drop stitch fabric comes from Korea and does not have the quality control that Maravia requires. Besides the legal ramifications of design, Maravia could not procure quality drop stitch at a price to make a profit.(2)

In 1995, actress Meryl Streep took to the whitewater and piloted a Maravia raft in the major motion picture, "The River Wild." (#u.) Not content to rest on their co-starring laurels, Maravia introduced its new Class VI fabric, developed for top-secret stealth rafts for the Navy Seals, as the industry's toughest benchmark. That year Maravia moved into a new, expanded manufacturing facility and showroom located along the Oregon Trail and the banks of the Boise River and Mike McLeod became Maravia's president.(1,31)

The Wind Series includes 2.5" D-rings, removable thwarts, repair kit, handles and a 10-year warranty. Maravia's Class VI base fabric and a Urethane coating that has over 40 times the abrasion resistance of PVC and over 15 times the abrasion resistance of Hypalon. Rafts come with self-bailing inflatable or standard NSB floors (for 22% less). The self-bailing floor is six inches thick. {* =Tapered tubes}

Wind Series (2015)	Length	Beam	Tube Dia	Wt.	Chambers	Price
Elan	12'	5'9"	18"	95#	4	$4995
Esprit	13'	6'	18"	110#	4	$5195
Ranger	14'	6'4"	20"	137#	4	$5995
Williwaw 1	14'	6'8"	20"	137#	4	$5795
Williwaw 1.5	15'	7'	21"	145#	4	$6395
Cyclone	15'	7'	21/16"*	145#	4	$6395
Williwaw 2	15'9"	7'6"	22"	160#	4	$6995
Mistral	16'3"	7'6"	22"	175#	4	$7495
Tempest 1	16'6"	6'8"	20"	159#	4	$7695
Tempest 2	16'10"	7'6"	22"	180#	4	$7695
Grand 18	18'	8'4"	24"	215#	4	$7995
Hurricane	18'	8'	24"	202#	4	$7795
Chubasco	19'	8'4"	28"	245#	6	$9495

The New Waves are built with the same strong base material and coated with the same tough urethane as all Maravias. All New Waves are royal blue with grey thwarts and floors with construction identical to Williwaws, except that they have three main air chambers instead of four and have no handles. The New Wave 1 is designed for 4-6 paddlers. Each New Wave has attachments for three thwarts and comes standard with two. The flat one-piece self-bailing floor is six inches thick with drop stitch fabric. Introduced in 1998, the Seal was designed for commercial owners of large fleets for the raft rental market. It was based on the same construction and design of the New Wave Series, but with two air chambers instead of three and a non-self-bailing floor.(1,2,13)

New Wave Series	Length	Beam	Tube Dia	Wt.	Chambers	Price
New Wave 1	12'6"	6'	17"	113#	3	$4695
New Wave 2	13'6"	6'3"	18.5"	116#	3	$4995
New Wave 3	14'6"	6'8"	20"	132#	3	$5395
Seal	11'6"	6'	17"	77#	2	$2995

The Spider, introduced in 1998 as part of the Voyageur Series, is designed for fishing or the fun of a small, light oar or paddling rig. With a diminishing tube design and narrow width, they can slip down low water conditions. An oar frame will work for 2 or 3 people and a small amount of gear. With paddles, 2 to 6 can be accommodated. The Spider comes standard with two thwarts and attachments for a third.(1,13)

Voyageur Series	Length	Beam	Tube Dia	Wt.	Chambers	Price
Spider	13'	5'9"	20.5/14"*	112#	3	$4295
Diablo	14'	6'3"	20/16"*	115#	3	$5195
Zephyr	15'	7'	21/16"*	145#	4	$6395
Typhoon	16'	7'6"	22/16"*	160#	4	$6995
Monsoon	17'6"	7'8"	22/16"*	211#	4	$7395
Maestro	18'	8'6"	25/18"*	211#	4	$7995

In 1998 Maravia introduced the Renegade, designed specifically for fishing. The boat was 12½' long, with a 6' beam and 17" tube diameter and had a self-bailing floor. It had a fisherman-designed frame with rear wraparound bars and a drift-boat anchor system. This boat eventually morphed into the Stream Tech Green Drake and Salmon Fly rafts(13)(#y.)

Salt Lake City based Holiday River Expeditions had been designing and purchasing rafts from Colorado Headwaters, a Denver-based company started by Chris Pearson after he left Maravia. Air retention problems with those boats led Dee Holladay to contact Maravia to produce a new design called the Monsoon that was similar to the Campways Hualapai. Their first purchase of 9 boats, having little rake to the bow, was met with mixed reviews from the Holiday river guides. The low rake and diminished tubes made them easy for guests to get in and out and provided good sitting and duffel space in each end. They were also rather nice to row in the wind but in the rapids the low rake meant that water would just "dump" in to the boat when hit by a large breaking wave.(20)(#z.) Since that time Holiday and Maravia have tweaked the Monsoon design and have developed a boat that ably carries passengers and large loads through big rapids on multi-day river trips.

Holiday used a combination of Maravia and Colorado Headwaters for the next several years and in 2005 purchased 3 more Maravia Monsoon boats. By 2006 Holiday began major purchases from Maravia. As of 2014 Holiday had purchased 40 Monsoon boats and 5 paddleboats from Maravia.(20) Holiday runs triple rigs at high water in Cataract Canyon. They store their boats inflated.

Outlaw Rivers and Trails, an outfitter operating out of Green River, Utah, in the 1970s and 1980s began with 6-8 white 18' Holcombe boats. During high water they triple-rigged the boats in Cataract Canyon and Westwater Canyon. Eventually they used several Maravia Williwaw models. The colorful owner A.C. Ekker is a Utah Canyon Country legend.(#ab.) Adrift (Moab) bought a new set of 3 yellow Maravias in 1979 and used them in Cataract Canyon high-water as a triple-rig.(23, 24) Vernal's Hatch River Expedition also used several large Maravia models.

Western River Expeditions, operating in the Grand Canyon and rivers in Utah, Idaho and Oregon has a fleet of over 60 Maravia's boats.(24)(#ac.) Western had one 18' and two 22'. Maravia rafts in the early 1980s. Brian Merrill doesn't think the 22 footers got used very much, because he found them buried in a stack and looking fairly new around 1993. The 18 ft. boat did get used for one season and was notorious for blowing seams. In 1982, it literally exploded on a guide named Lou Grossman when he hit the hole in Surprise rapid in Desolation.(27)

Brian remembers: "So, when Doug Tims purchased Maravia and came to us, we were understandably a little skeptical. I remember that we had some trouble with leaky floors the first year we got some of the new generation Maravias, but we sent the floors back over the winter and they gave us new ones that worked very well. The very first generation of the new urethane coated boats tended to fade with sun exposure, but it didn't take long for Maravia to get that corrected. The fleet we have now is fantastic."(27)

“Like any "plastic" boat, you can't really roll them, so we fold them. They hold air better than any other boat we've ever had and the colors hold up incredibly well. We have a red one hanging in the tower out in front of our Moab Adventure Center that has been out and exposed to the sun constantly since 2003, and it still looks great and it still holds air well. Maravia also pumped it full of the little foam beads that you find in bean bag chairs, but it also has to hold pressure to look good.”(27) Western’s early experience with Maravia reflects that of a number of companies and individuals who purchased the earlier models, but Maravia has been diligent in correcting issues and improving on those early problems.

When Maravia was trying the livery and non-encapsulated market they produced as many as 516 rafts in one year. They tried the inflatable kayak market, but found that smaller, less expensive rafts could not be built in America with a living wage, benefits and U.S. environmental standards and still compete with less-expensive foreign-made brands. At the height of the economy and river running in the 1980s they were producing around 600 boats a year.(28,2) Today Maravia is building around 200 boats a year for the higher end of the private, commercial and fishing markets. (2,28,30)

The company has around 7 employees but can ramp up to 14 or 15 in their 25,000 square foot plant. Many employees have been with the company for a long time. Chris Frazee began his river experience as a swamper on Idaho rivers at age 17. By 2001 Chris was the Western Sales Representative for both Cascade and Maravia. In 2013 Frazee, Maravia’s National Sales Manager, became President of the company and George Aragon became the President Emeritus. Kyle Overman, Service Center Manager, has been with Maravia for 23 years and Nouk Mongkhon has been with Maravia since they began in Idaho - 28 years ago.(2,12,28)(#aa.)

Maravia is a leading manufacturer of inflatable rafts for the river-running industry and is always working to design and build a better boat. The rafts have served the test of time well, enabling professional outfitters and private river runners alike to float virtually millions of river miles, from China's Yangtze to Idaho's Selway, from Chile's Bio-Bio to West Virginia's Gauley and the Colorado River through the Grand Canyon. The company has always been proud of making an American-made product, using American labor and materials. Maravia’s "Seamless Encapsulation" coating of multiple layers of urethane now has over 5,000 encapsulated rafts in the water. This gives Maravia inflatables resistance to abrasion from rocks and sand, chafing of frames and gear, resistance to UV and low maintenance. Urethane encapsulated rafts are just tougher boats that require less maintenance.

George Aragon began on the lowest rung of the Maravia Corporation, and through the years as he gained experience and knowledge he moved up to the company’s presidency. George is one of those rare individuals who can grasp complex issues and develop solutions to problems. One of the special assets of Maravia is how rapidly they develop new and better technology, and how rapidly they adjust to customer’s needs and a changing market. Like Aragon, the new company president, Chris Frazee began at the lower rungs of the business and he quickly grasped the complex issues of management, new technologies and production. Maravia boats, with their drop-stitch floors, seamless encapsulation and their made-in-America heritage will be plying the rivers for a long time into the future.

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(22) Email from Robert (Tubby) Tubbs to Herm Hoops; April 15, 2015;

(23) Email from Dennis Willis (Price UT BLM River Manager - Retired) to Herm Hoops; April 15, 2015;

(24) Email from Jason Taylor (Western River Expeditions & Moab Adventure Center) to Herm Hoops; April 15, 2015;

(25) Obituary from "The Times Independent;" Moab, Utah, Barbara Ekker: November 12, 2000;

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(27) Email from Brian Merrill (Moab Area Manager, Western Rivers Expeditions) to Herm Hoops; April 16, 2015;

(28) Email from Chris Frazee, (President, Maravia Corporation), to Herm Hoops; May 01, 2015;

(29) Email from Chris Frazee, (President, Maravia Corporation), to Herm Hoops; May 08, 2015;

(30) Email from Doug Tims, (Maravia co-owner retired), to Herm Hoops; October 06 2015;

(31) Email from Mike McLeod (Maravia co-owner retired) to Herm Hoops; October 13, 2015;

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MISCELLANEOUS

- Hull Codes: MRV (MRV: Maravia Corporation)
  MCI (After they moved to Idaho - MCI: Maravia Corporation of Idaho)

- Maravia; P.O. Box 395, San Leandro, California 94577 (Original Address)
- Holcombe Industries; 1602 Tacoma Way, Redwood City, CA 94063 (Original Address)
- Maravia Corporation; 602 East 45th Street, Boise, ID 83714; Phone : 800-867-7238
  Local : 208-322-4949; Email Us: mail@maravia.com
- Maravia distributer: Cascade Outfitters; 604 E. 45th St. Boise, ID. 83714; (800) 223-7238
  www.cascadeoutfitters.com
- Maravia distributer: Freelance Fishing and Guide Service; Robert Seay; 123 N. Court St. Fayetteville, WV; (304) 640-0480; www.2fishwv.com
- Maravia: Public Television, March 30, 2015; A video from PBS showcasing how Maravia rafts are built in factory, guided by president Chris Frazee

SIGNIFICANT NOTES:

(#a.) Design of the Havasu Model Raft:

While most people give Vladimir Kovalik credit for the design of the Havasu, George Aragon remembers it a little differently: "There's a lot of old stuff where the Havasu (model raft) came from. So I know the real Gordon Holcombe story that he told me. We made hundreds of thousands of the (life vests) for the first five or six years on radio frequency welders. We made the beacon light that flashed when they (hit) salt water. Then we were asked to build some boats, I don't know who the original customers were, I think John Dale may have been (the customer) a Grand Canyon operator. The very first boats we were building were 18' to 25' boats. One of the boats we tried to build in the very beginning was a boat that Gordon had patterns for, was what he called the Havasu. It was a rounded boat, all the seams went around, and they weren't mitered sections. Vladimir Kovalik hung around our shop in San Leandro quite a bit and he was friends with Gordon. At a certain point in the very early stages, I wouldn't say there was a falling out, because Gordon Holcombe didn't have a mean bone in his body, but there was something that happened that Vladimir had gone to Campways with the patterns and they were building that boat and they called it the Havasu. There was always a hard rub there, as to who really came up with that design. But for Gordon, he said, well, who cares, we'll continue to do our thing and we'll continue to make a better boat. But the way I remember it was that Havasu was designed by Gordon Holcombe.(2) For a History of Campways and the Havasu Model see: "*A History of Campways and Riken*," Herm Hoops, 2015; The University of Utah; J. Willard Marriott Library; Special Collections Department; 295 South - 1500 East; Salt Lake City, Utah 84112-0860 (www.lib.utah.edu)

(#b.) Switlik Parachute Company:

In 1920 Polish immigrant Stanley Switlik and George Putman (Amelia Earhart's husband) started the Switlik Parachute Company. The company developed other products including the "Mark II" life vest for the Navy in 1947, inflatable one-man life rafts were developed for the Navy in 1949 and in 1951 Switlik manufactured a large quantity of 20-man life rafts for the Air Force. The Switlik Parachute Co. has been owned and operated by the Switlik family for four generations and is a manufacturer of the highest quality sewn and heat-sealed inflatable safety and survival products for the aviation, marine, and military markets. Their products include a wide variety of anti-exposure and anti-gravity suits, inflatable life rafts, inflatable life vests, inflation systems and other specialty textile-based military equipment all manufactured at an 85,000 sq. ft. facility located in Trenton, NJ USA. See: "*A History of Inflatable Boats and How They Saved Rivers*," Herm Hoops, 2014; The University of Utah; J. Willard Marriott Library; Special Collections Department; 295 South - 1500 East; Salt Lake City, Utah 84112-0860 (www.lib.utah.edu)

(#c.) Early Holcombe Products:
After launching dummy guidance test torpedoes Holcombe built a unit that would inflate automatically and bring the torpedo to the surface for recovery. The submarine covers were to camouflage and hide submarines from detection when they were in port. Gordon designed some of the very early inflatable commercial aircraft escape slides. The swimming pools were made of huge diameter rings of tubes that were reinforced by smaller and smaller rings. The Navy used the pools to transport dolphins that were trained to perform tasks such as ship and harbor protection, mine detection and clearance, and equipment recovery. The program is based in San Diego, California, where animals are housed and trained. The Navy Marine Mammal Project animal teams have been deployed for use in combat zones, such as during the Vietnam War and the Iraq War. The program has been reported to be terminated in 2017. George Aragon and others think that Gordon Holcombe designed the horse collar life vests with the flap on the back. In 1973 or 74 Holcombe made a very large inflatable dubbed "The Raintree Cattle Barge" from a PVC coating on a Kevlar base fabric. An almost entirely female crew built two of the boats, one of white fabric and the other of black fabric. The buyer paid cash for the boats, and years later it was found floating in the ocean between Cuba and Florida and was probably used for trafficking drugs.(2)

(#d.) George Aragon:
George Aragon's initiation to Holcombe Industries began in 1973, after the company had left their redwood City Location. Dick Ford, Chris Pearson, and Gordon Holcombe were forming the company and they leased a building from a company George's father Tony who ran an adjacent electrical company. The company had a couple of bays they weren't going to use and Holcombe leased them. In George's words: "my dad said: hey are you going to be hiring any employees? They said yes and he said can I send my son down and they said absolutely. My dad called me and said: I might have found you a job, get cleaned up and come down. So I went down there, and this was in San Leandro, California. I walked in, my dad introduced me to the three guys in the empty warehouse, and they said if you were able to work for us when would you be able to start? I said I can start any time, and they said grab a broom. And that was my initiation to Holcombe and Maravia."(2) After 33 years of raft building, George Aragon, is still "President Emeritus" of Maravia.

(#e.) Maravia:
Mar (Marine) avia (Aviation). Marine Aviation because Gordon Holcombe was the inventor of the Cyanamid chemical light sticks used primarily by the marine industry. He did not invent the chemical Cyanamid, what he invented was the glass tube that held one chemical and a plastic tube that held the other chemical and when you bent the plastic tube the glass one broke and when you shook it the tube gave off light. The light sticks were used for survival vests, on survival boats. Gordon held all of the patents, and had full-control of anything sold in chemical light sticks. Early on Maravia made an emergency beacon light that flashed when it hit salt water. The first five or six years Maravia made hundreds of thousands of inflatable horse collar life vests that were constructed on radio frequency welders. The company originally made some dinghies for Yacht tender.

Maravia is on U.S. Government Contract, but is not currently on U.S. Military Contract (2014). Maravia has a GSA contract and sells rafts to all of the federal river management agencies. It has also worked as a subcontractor on two different prototype programs for inflatable assault rafts. The company is Jones Act and Berry Amendment compliant.(#q.) Maravia supports the river industry and river conservation and are members of Idaho River Outfitters and America Outdoors. Maravia is a company manufacturing an American product, with American labor and materials. When others were moving production overseas George Aragon was one of the manufacturers who said: "I'm not doing it. When it's done I'm shutting it down. And I had the support of Doug Tims and Mike McLeod. I refused to go overseas. There was a time in our history when I said: Oh Oh, I made a critical mistake. Now it's coming back around."(2)

(#f.) Gordon Holcombe, Chris Pearson, Dick Ford and Bob Ford:
When Chris Pearson left Maravia he went to Denver, Colorado and manufactured his own line of boats named Colorado Headwaters. For a while Dee Holladay of Holiday River Expeditions liked the Headwaters tapered bow, produced by CAD application. See April 4, 1995 issue of "Key Solutions" newsletter. Bob Ford was the Commodore of the St. Francis Yacht Club for many years and Richard (Dick) F. Ford, his son that ran Maravia went on the be the Commodore of St. Francis - a very prestigious yacht club.(2,5)

(#g.) Maravia Locations in California:
The San Leandro operation continued to be the main plant when the expansion to Oakland took place. Eventually Maravia moved all manufacturing to San Rafael, which was closer to where the Dick Ford family lived. The surprising thing was that most of the employees came with the move despite the long commute. Maravia arranged commuter ride share vans to bring the employees across the bridge for another 6 or 7 years.(2)

(#h.) Vladimir Kovalik:
Vladimir Kovalik had been working with Holcombe Industries on development of his dream raft in early 1971 or late 1970. Gordon Holcombe, of Holcombe Industries, had begun building two sizes of the Havasu for Vladimir but they were having problems with the vinyl and leaking seams. It may be that Gordon Holcombe and Vladimir knew each other from their days working for the Stanford Research Institute (SRI). At SRI Kovalik's work was related to the military and Gordon built submarine covers to hide the submarines when they were in port for the U.S. Navy. Vladimir might have suggested using the submarine cover material, which was very tough but didn't hold adhesive well, to build the first Havasu rafts. The first batch of Holcombe boats arrived and were on the water in 1972. The sleek boats were white and had their signature curve bow and stern design that eliminated the "stove pipe" design that often caused other rafts to fold when taking a big hit from a powerful wave. Kyle Kovalik remembers: "Unfortunately, they leaked like sieves and we would have to pump them up at lunchtime. In the mornings they would be nearly flat on the beach." (3)
- {See also: Campways & Riken History, by Herm Hoops, 2015; The University of Utah, J. Willard Marriott Library, Special Collections Department: Herm hoops Collection;}
- {See also: *Boatman's Quarterly Review*; Volume 26, number 4, winter 2013-2014;}

(#j.) Doug Tims and Mike McLeod:
Doug Tims had originally moved West from Cleveland, Mississippi with several friends because they liked Idaho and had become hooked on river running. He brought with him an extensive background in manufacturing, retail distribution and sales. Tims had purchased a Middle Fork of The Salmon River outfitting business from Ron Gillette (Triangle C) and Woody Hassinger (Frontier Expeditions). During the negotiations Gillette told Tims he had a smart, talented guide working for him who was just finishing college and Tims should talk to him about being part of the business. That is how Doug Tims met Mike McLeod, a native of Canada.2,7,10,30)

In 1985 they bought Steve Curry's Selway operation, and in 1988 bought Don Hatch's Selway operation. In 1988 they sold the Middle Fork operation to Les Bechdel, who renamed it Canyons, Inc. and in 1998 they sold half of the Selway operation to Marty Smith at Three Rivers Rafting.

When McLeod and Tims started Northwest River Company they were running 13 trips a year on the Middle Fork and later added 8 trips on the Selway. Mike had graduated from college with a degree in marketing and economics. McLeod wanted to get married but he only worked during the river season and the woman was not going to marry him unless he had a full time job.(2,7,30)

The 13 Middle Fork launches required that they double up operations every August. In June and July they launched together on a six-day trip every 8 days. In August they had a launch every 4 days, so Mike would take one and Doug would take the next. Because of the double launches they needed two fleets of rafts and gear.(30)

In 1980 Doug took a trip on the Bio Bio with the Nantahala Outdoor Center (NOC) that was run by Les and Susan Bechdel. Tims remembers: "I knew the Bechdels from my days of driving from my home in Mississippi to NOC to canoe rivers in the southern Appalachian area. 1980 was the first year for NOC to do Bio Bio trips, so we figured it would add to the adventure by going with a rookie operation. On that trip Les and Susan were running a new fleet of rafts they had purchased from Maravia in California."(30)

In the winter of 1982-1983 Mike and Doug went to a Western River Guides meeting in Sun Valley looking for boats to buy for the new Middle Fork operation. Verle Duerden from Provo, UT was the Maravia sales representative and George Aragon was at the show. Ron Mattson with Cascade Outfitters exhibited his frames and boxes. Ron had developed a package that used his frames, boxes and coolers in a 19-foot version of the Maravia Chubasco raft with a suspended plywood floor that made it a self-bailer. Tims and McLeod made Maravia's and Cascade's show when they purchased a fleet of boats for two Middle Fork operations - 2 Chubascos and a bunch of standard floor New Rivers, Williwaws and Esprits.(30)

After three years the Idaho operation we needed some work on the rafts and Tims and McLeod decided to drive to California to take the boats and see where they were built. "On the drive down Mike and I were discussing ideas about how we might expand the business. He was working winters in the ski business, so we talked about that as one option. At one point he said, "Why don't we buy Maravia?"(30)

By this time Dick Ford and Chris Pearson had left the company and Phil Ford was running it. "Mike and I were impressed with George's production operation, but not by management of the company. Phil was nowhere to be found. A secretary would show up about 11AM with a six-pack of beer and a baby in a crib next to her desk, work a few hours and leave."(30)

"While talking to George we found out the company was for sale, so began negotiations with Bob Ford. The finances were a mess. We had little to go on, so I asked Steve Korby, my University of Texas college roommate to come out and help us evaluate it. Steve had become a venture capitalist and a master of Lotus 1-2-3 spreadsheets and the new IBM PCs. After several days of looking at the operation he developed a spreadsheet financial model. I'll never forget putting him back on the plane to Texas when he told me: "Doug, it is a whole lot easier to make something like this work in a spreadsheet than it is on the factory floor!" Truer words were never spoken."(30)

So Doug told Aragon: "George this could work for myself, Mike and you. If we purchase Maravia would you be interested in coming on, and I (Aragon) said yes. Maybe we would try to take it to another level and Mike would have a full time job and he could marry his sweetheart and we would be more into the white water industry."(2,7,8) The three men decided to keep the name Maravia, with its rich tradition. They thought that if they could turn the struggling company around, build on design and performance they could build a new reputation for durability and reliability.(2,8,10)

Originally Mike McLeod was National Sales Manager and handled all of the sales activity. Significant sales growth in the early 1990s allowed the addition of two additional sales resources, providing more customer contacts and greater coverage across Maravia's total market.

In 1995 McLeod assumed the role of President and National Sales Manager and continued in those roles until his departure from Maravia in February of 2000. In 2000 Mike McLeod went on to a successful career at Hewlett Packard. In 2009 Tims sold the last of the Selway operation to Ari Kotler who operates it under the name S.O.A.R/Northwest River Company.(30,31)

(#k.) Robert Seay - Freelance Fishing and Guide Service
Robert Seay is the owner of Freelance Fishing and Guide Service, a fishing and hunting guide service in the New River Gorge Region of Southern West Virginia.

(#l.) Cascade Outfitters
In 1979 Ron Mattson founded Cascade Outfitters in a small outbuilding at his rural home in Oregon. An avid river runner, Ron's Goal was to reach out and share his passion for the sport and the knowledge of the equipment with others. Mattson eventually sold Cascade to Jack Nelson. Matson was on the ill-fated Yangtze River Expedition led by Ken Warren. Ron Mattson died in an Oregon coast bicycle race when he rode his bike off a cliff and died in August 1995. When Jack Nelson was planning to sell Cascade Outfitters, Maravia decided to buy it and move it to Boise, but run it as a separate entity. Cascade is a dealer for AIRE, NRS and other purveyors of river equipment. (2,30)

(#m.) Yangtze River Expedition
In 1986 the Upper Yangtze River Expedition led by Ken and Jan Warren took two nearly two months and covered roughly 1100 miles of the first descent of the Yangtze from the source in Tibet at 17,600' to take-out just above Batang in western China. From the September 13, 1986 © Associated Press: A team of American adventurers has given up its attempt to raft down the wild upper reaches of China's Yangtze River after becoming stranded when its boats capsized, a spokesman says. In a telephone interview from Batang, China, Jan Warren told The Oregonian newspaper Friday that she and her husband, Ken, and five other Americans will be returning to the United States shortly. Ken Warren and nine members of the team made their way overland across more than 125 miles of primitive mountain area, reaching Batang on Thursday. “We've all run out of time," Mrs. Warren said. "We have no oarsmen; the equipment for the river run is back where they left it, and we have a long and difficult journey to get it." "Basically, you can say we're giving up the river. It would be impossible for Ken to go down it without oarsmen. They are going home." "We are extremely disappointed about the outcome of the entire trip," she added.

Ken Warren said shortly after his arrival Thursday in Batang that he intended to continue his river trip and indicated that his expedition members would go with him. However, Ron Mattson of Monroe, Ore., Ancil K. Nance of Portland and three Chinese oarsmen, plus three members of the camera crew from Wild Country Productions, Aspen, Colo., decided not to continue.

John Wilcox, president of the film company, said he instructed his people not to continue on the river for safety reasons. One expedition member, photographer David Shippee, 28, of Boise, Idaho, died of pneumonia Aug. 3 in the high mountains through which the river passes. Four American expedition members subsequently returned to the United States. Mrs. Warren said she and her husband knew that a Chinese team had gone on. They had been waiting for them at Tiger Leaping Gorge, described as the most hazardous stretch on the river. The official China Daily said there were eight Chinese in the expedition, and members of that expedition became the first to conquer the vicious rapids in the gorge. The Chinese went through the waters in a blockhouse-like boat with eight tires tied around it for protection. In three minutes, they went over three waterfalls ranging from 6 ½ feet to 23 feet.

(#n.) PVC

PVC, which is also commonly referred to as "vinyl," is made from two basic substances: chlorine, which comes from salt, and ethylene, a compound derived from crude oil. The chlorine and ethylene are combined to produce ethylene dichloride, which undergoes high heat and polymerization to create the powder known as "polyvinyl chloride resin." To make PVC fabric, manufacturers process PVC resin with other materials to obtain the desired color and texture, and then use the PVC to coat one side of a knit fabric, such as polyester or Lycra. The origins of PVC fabric date back to the early 1920s, when a scientist named Waldo Semon discovered a versatile new material. He called this new product "polyvinyl chloride," or "PVC." In the following decades, PVC was used in a variety of products, from piping to raincoats, with PVC-coated fabrics gaining popularity in the 1950s and 1960s.

(#o.) Seamens Fabric

Holcombe and Maravia have been customers of Seamens Corporation fabric since the 1960s. Seaman Corporation traces its origins to a basement workshop in Canal Fulton, Ohio, equipped with two sewing machines and fueled by Norm Seaman's dedication to create fabrics that could set a new world standard for versatility and performance. Today, Seaman Corporation has a modern corporate headquarters, product development laboratories and a primary manufacturing facility in Wooster, Ohio. In addition, the company also has a state-of-the-art weaving and coating facility in Bristol, Tennessee.

Seaman Corporation manufactures innovative high performance fabrics, entirely made in America, composed of proprietary knitted or woven base cloths and coating formulas. Seaman fabrics have been sold world-wide since 1949, and are used in high performance roof systems, geomembrane liners, truck tarps, architectural structures, for recreational products like inflatable boats and more. Seaman Corporation, is Mil. Spec. compliant, and it maintains samples, strength and other records required for U.S. and other military/government fabric specifications.

Seaman Corporation’s vertical approach to creating high performance fabric starts with the selection of strong fibers, their own proprietary weaves, and their exclusive coating compound formulations, often utilizing Elvaloy® KEE by DuPont™ as the principal polymer. The manufacturing effectively creates a molecular bond between the base fabric and the coating compound, creating a monolithic structure. Laboratory and actual field experiences prove the fabrics typically remain exceptionally flexible and strong, even after long-term exposure to challenging environments and abusive conditions.

(#p.) Drop-Stitch Self-Bailing Floors

Maravia made a few I-beam floors but one of the early, early military projects for Special Forces was called the MARS (Military Assault Raft) Project and Holcombe was certified to repair them. The early drop stitch came from rubber companies like Rubber Fabricators. They were building fuel cells for F-114 (military planes), and the drop stitch fuel cells were in the wings so they would collapse as the fuel was used up. To keep pressure on the “bladder” it whey would use some inert gas or air to collapse the bag and limited the air in the fuel bag. Each thread in a drop-stitch floor has a 3 lb. Breaking strength and there are 5,000 threads per square foot.

In 1986 Maravia was one of several companies competing to perfect the inflatable, self-bailing floor developed by the military in 1942. Maravia found that the drop-stitch bladder, like the one used in military survival rafts made a better performing, flat bottom inflated floor. But the bladder, coated with rubber, had to be put inside a PVC “pocket” to attach it to their raft tubes. The “pocket’ was sealed with a zipper that leaked and permitted water to enter the floor and river silt between the bladder and “pocket” caused more maintenance headaches.

Zeke Lauck was working for a California outfitter and remembers that Maravia sent them a prototype that had the problem of the floor, attached with lacing, filled with water and it took on water and sank into the river considerably.(9) Doug Smith bought the Dinosaur portion of their business from Rick LeGrand who operated LeGrand Adventures. Rick had one Maravia 18-foot glued boat with no floor. He suspended plywood floorboards from chains. Rick kept that boat and he also had a 14 foot Maravia Williwaw I that was also a glued boat. It was part of the transfer of equipment to Eagle Outfitters. The glue failed and they couldn't keep up with the air loss, they kept the floor, but took the rest to the dump. Eagle still runs a 16 foot Maravia Mistral welded boat and Smith loves that boat.(26)

By 1988 Maravia had perfected the floor by laminating a light gray colored urethane coated fabric to the drop-stitch floor. Maravia does not install pressure relief valves (PRV) in their floor because of the strength of drop-stitch and because of the unreliability of PRV's that leak when heated or clogged with river silt causing the floor to become soft. They stress the importance of customers monitoring the pressure in the floors of their boats.(7,8)

In "The Self-Bailing Revolution" article in the January/February 1986 issue of *River Runner Magazine,* author David Bolling referring to PVC drop-stitch floors stated "They also flip more easily than spongier Hypalon according to some owners." In the following issue of the magazine Maravia's Mike McLeod took exception to Bolling's remarks. McLeod responded: "... our unique use of PVC fabric and designs allow a boater to avoid more flip situations and recover more easily from those they inadvertently enter. Our PVC fabric has a base polyester weave with a reduced elongation tendency. This means the fabric gives to a point, then stops, creating a rigid, stable raft. A rigid raft punches through waves and holes better. A spongy raft will conform to the shape of a wave or hole, creating more holding surface, placing you more at the mercy of the force of the river. We suspect this thought on easier flipping comes from the fact that our boats (Maravia) are lighter, and any raft lightly loaded is more likely to flip."(17,18) At any rate, as self-bailing rafts became more popular, boaters had to relearn how to properly load these more buoyant river craft.

(#q.) The Jones Act and Berry Amendment

The Jones Act: The Merchant Marine Act of 1920 (P.L. 66-261), also known as the Jones Act, is a federal statute that provides for the promotion and maintenance of the American merchant marine industry. It requires that all goods transported by water between U.S. ports be carried on U.S. flag ships, constructed in the United States, owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents. The Berry Amendment is a statutory requirement that requires the Department of Defense to procure covered items, including fabric and manufacturing to be produced in the United States. The laws were used by Bill Wing, of Wing Inflatables, to restrict foreign inflatable manufactures from securing military contracts. Wing asked for Maravia for help but Doug Tims was reluctant to help Wing as Maravia was working on their own military contracts. See more detailed definition and explanation in a separate document: The Jones Act & Berry Amendment.

(#r.) Leafield Valves

Leafield Marine is a leader in the design and manufacture of valves and inflation systems for a wide range of inflatable structures including Life Rafts, Inflatable Boats, Marine Evacuation Systems and River Rafts. To ensure consistent and reliable performance in critical applications, all design and production is carried out to Quality standard BS EN ISO 9001: 2008. The new D7 (2014) valve from Leafield is designed for use in drop stitch panels such as raft floors, and stand up paddle boards. It features a screen that keeps drop stitch threads out of the way of the valve seal. The O ring and the sealing surface around the top does not use the black ring of the C7. The screen does increase inflation and Deflation time slightly.

(#s.) Urethane Coating
In 1988 design engineers for the U.S. Navy inflatables had heard about Maravia's use of hot air fabric welding and they visited the plant. The Navy SEALS were having delimitation problems with glued seams on their inflatable boats.(#x) As they toured the Maravia Plant, Doug Tims commented that it took nine hours to glue the chafer material on the rafts and he said, "Wouldn't it be nice to just paint it on!"

The visiting Navy engineer gave Doug the phone number of the maintenance chief of SEAL Team One in Norfolk, Virginia who had been working with a Virginia company developing a way to paint urethane on the SEALs' rafts to make them tougher. Maravia has been working with the company, Technical Urethane of Virginia, since that time.

Urethane is used to line steel chutes and hoppers in the mining industry to protect the steel from abrasion by rocks and ore sliding through. There are different levels of urethane hardness. It can be manufactured in a variety of hardness ranging from rubber band soft to bowling ball hard. Different urethane coatings, when applied may look similar but their properties (adhesion, durability, etc.) can be quite different. The military tests that were done to test the relative toughness of urethane against commonly used materials a 50/50 mixture of water and sand was prepared. A bar sample of each material was then rotated at an average velocity of 680 feet per minute for seven hours. The volumetric loss of each was then measured and compared to a carbon steel sample which was assigned a relative value of 100 for material loss. A lower value indicates a better abrasion resistance: Maravia Urethane - 10; Stainless Steel - 82; Carbon Steel - 100; PVC - 532; Aluminum - 1042. In the tests Hypalon was roughly comparable to PVC. Early on Maravia may have used too light a fabric which caused occasional adhesion problems with the coating. Rafts coated with urethane are repaired by sanding the surface, cleaning with solvent, applying two thin coats of adhesive like Stabond UK148 and pressing the parts together.(7,8)

In the late 1980s, especially as Maravia transitioned to new production methods there were issues with seam separation and also separation of the urethane from the boats. Anecdotally this was attributed to a shipment of adhesive that was delivered to the Boise factory during the Christmas holidays and no one was at the plant. The delivery left the 35-gallon drum of adhesive outside and it froze. A number of boats required reconstruction, and it is commonly accepted that Maravia failed to follow their warranty.(15,19,20)

Barry Hatch remembers: "Hatch had ordered four 22' pontoons, something Maravia had not made before. They were light blue and 8 feet wide, the tube diameter was about 28 inches. The following year Hatch ordered a 27' long pontoon to use on the 1-day (Split Mountain trip)." Barry Hatch is pretty sure they were glued construction not heat welded. "The Hatch pontoons had air leakage at the seams and the curves of the air chamber. The bends that made the tube curve 180 degrees on each end were made by 4 bends. These bends in the tube were made by applying glue to the surface and then bending the tube to the shape needed. It was then held into that position until the glue dried and viola, you had a corner bend. We know that's how they made the tube bends because we had some of these glued bends fail, leaving the tube straight again with no bend where it was needed. They also had the white plastic military style valves which we found to be trouble prone but easy to replace. Several years later we bought a yellow Chubasco; it was a pretty good boat."(15,16,19,21)

(#t.) Greg Ramp, Alan Hamilton & Chris Walker
Greg Ramp started R&R Inflatables in Grants Pass, Oregon in 1984. He designed the Challenger self-bailing kayak. R&R merged with Maravia around 1987 and Ramp was the vice president of Research and Development at Maravia. By the end of 1988 Ramp decided to leave Maravia.

One of Ramp's concerns at Maravia was the urethane spray that is very toxic. In his words: "Its very toxic. I didn't like what it was doing and just thought it was going in the wrong direction. I was trying to get where there weren't any adhesives, toxic chemicals or solvents used in the manufacturing process." When Ramp began he was using a single membrane process just like everybody else. In a 2016 interview Greg said: "It's a struggle, you build a boat and then you go around chasing leaks, it's a lot of labor. When I was at Maravia we were approaching 100 hours of labor per boat and we got it down to 60 hours after the spray coating." "Those guys (Maravia) have gotten that process to work for them, they had some tough stuff at the beginning."(33)

Greg Ramp, Chris Walker and Alan Hamilton eventually started AIRE. Alan is retired and is living in McCall (Idaho). Chris Walker formed his own company called Oceanid (Rescue Boats: Oceanid Inflatable Rescue Boats and Rapid Deployment Craft) in Washington. Chris Walker came up with the rescue boat using drop stitch. Maravia was building boats for Walker for some time.(2) In 1988 Greg Ramp designed the thwart attachment used by Maravia to this day. Until that time Maravia had been using a cumbersome lace-in design and they were searching for a better, more efficient solution to thwart attachments. George Aragon said: "When Greg first brought his new design to me, my first thought was 'It's so simple, why hadn't it been done before." "As is usually the case, the best design is one that is easy to use and simple to operate."(7)

(#u.) The River Wild and Scotty Christensen

The movie River Wild was filmed using Maravia Rafts. Scotty Christensen, a boatman for Don Hatch River Expeditions from around 1984 - 2000, was slight of build and had long blond hair. Bob Havice, an old Hatch boatman, was a stuntman for many years. Havice called Clark Hatch from Kalispell where they were filming asking for a female guide to be Meryl Streep's double. Clark told Bob that the perfect female candidate was currently on the Middle fork for the next seven days. Havice paused for a moment, and busted out: "Fuckin Scotty. He's perfect! We'll shave his face and legs! Where is he?" Clark Hatch replied, "he's welding a bumper on the floor." Five hours later Scott was on a plane to Montana and by the next morning was shaved and had a wig. He made enough money in two months to live for a full year! Scotty was one of two Hatch boatmen who did stunts for the movie in place of Meryl Streep. The other Hatch Boatmen who was the stunt person for Meryl was Chad Huffaker. He was also picked as stunt double because he had the same hair color and complexion as Meryl. On one shot when the boat goes over a falls, Chad was hooked on to a rope and harness and was pulled free as the boat went over. He also did some swimming scenes. Chad worked for Hatch for about six years, Bob Havice passed away recently, and Christensen lives in Colorado and works with John Hatch in the energy industry.(14,15)

(#v.) Thermofusion and RF Welding

In 1986 Mike McLeod had researched the products of other industries, like those that manufactured pond liners and building roofs. He discovered that hot air and radio frequency welding were the state of the art processes used by those industries. George Aragon and McLeod visited Al Miller in Ohio, a hot air equipment welding expert. The Thermofusion process uses heat and pressure to mix the coatings on two pieces of coated fabrics, merging them into one. Thermofusion equipment uses electronic circuitry to precisely control the heat and speed of the process for the perfect fusion of the coatings. Too much heat would make the coating brittle, and with too little they would not merge. The change between Maravia's failure rates on welds improved significantly from 1987 to 1988. In 1987 the failure rate was less than 15 one-thousandths of one percent. In 1988 the failure rate was zero.

RF Welding stands for radio frequency welding. A machine, that is truly a large radio transmitter, focuses radio waves between two large metal plates and a metal die placed between them. The molecules of thermoplastic material placed in the die are excited by the waves, heating the material to melting. Then large air-driven cylinders press the materials together to weld parts like d-rings, valve boots and thwart attachments.(7)

(#w.) Seamless Encapsulation
In 1989 Maravia began manufacturing boats with seamless encapsulation that used a rotational process a lightweight thermofused raft form with a continuous, seamless coating of urethane. The process controls the rotation to add thicker coatings to wear areas, add texture to the top of the raft to produce a non-skid surface and to create a slick bottom to slide over rocks eliminating the need for wrap floors and wear chafers. The rotoprocess can make the bottom corners 50 mil. thickness, the rest of the bottom 40 mil. thickness, and the top 20 mil. thick - or any combination required with no exposed edges.(7)

(#x.) Navy SEAL
The name SEAL is the United States Navy **SE**a, **A**ir and **L**and teams. They are the U.S. Navy's principal special operations force and a part of the Naval Special Warfare Command (NSWC) as well as the maritime component of the United States Special Operations Command.

(#y.) Stream Tech Inflatables
See the History of Stream Tech by Herm Hoops, 2015; University of Utah, J.Willard Marriott Library, Utah River Running Archives;

(#z.) Colorado Headwaters
See the History of Colorado Headwaters by Herm Hoops, 2015; University of Utah, J.Willard Marriott Library, Utah River Running Archives;

(#aa.) Kyle Overman & Nouk Mongkhon
Kyle is the Service Center Manager for repairs and Nouk is the lead welder and he makes d-rings and handles.

(#ab.) Outlaw Trails Outfitters and A.C. Ekker:
Obituary Edited from the Moab, Utah "Times Independent"
A. C. Ekker died Sunday, November 12, 2000, enroute to St. Mary's Hospital in Grand Junction aboard Life Flight following a plane crash that morning at Sam's Mesa near his cattle ranch at Robber's Roost in Wayne County. A. C. was flying is Cessna 174, searching for cattle across the vast rugged area west of Canyonlands.

A. C. was a symbol of the American Cowboy. He inherited and owned and operated the Robber's Roost Ranch and the Rain Dance Ranch in Hanksville along with his wife, Dr. Glori Allen-Ekker, a physician at Castleview Hospital in Price. During his life, he was in articles in National Geographic, Sports Illustrated, Range Magazine and Western Horseman. He and his father operated Outlaw Trails Inc., taking tours and running rivers. A. C. Later worked with Ron Smith of Canyonlands Expeditions, headquartered in Green River A. C. started an overseas company, Cabalgata Tours, which took him to South America, Africa and New Zealand, but he always returned to his favorite home in Wayne County and his wife, Glori, and ranch life.(22,23,25)

(#ac.) Western River Expeditions:
Western Rivers Expeditions began in 1961 and has grown to be one of the largest river outfitters in the world, carrying more customers than any river outfitter on multi-day river trips. Besides operating in the Grand Canyon, they have commercial permits for Westwater Canyon, Cataract Canyon, and the Moab Daily on the Colorado River, at one time Western held a permit in Dinosaur National Monument, operates on the Green River through Desolation Canyon, Main Salmon, Lower Salmon, Middle Fork Salmon and Snake Rivers in Idaho, and on Oregon's Rogue River.(24)

(#ad.) The Raft Idea:
The aircraft escape slides Holcombe was building were for the 727 generation of aircraft. When the first jumbo jet, the DC 10 came out, it was necessary to redesign the slides. The jumbo jets were taller and the bottom of the escape slides had to be curved to slow the passengers down as they slid from the higher fuselage. Gordon Holcombe was working with Ivan Swickard, the person in charge of patterns, to curve the bottom of the slide when they decided the curved tubes resembled raft tubes, hence the idea to get into that line of business.(30)

(#ae.) Kovalik's Holcomb Boats:
(From Bart Henderson BQR - Spring 2006)
My boat was the first boat to get bitten by a hippo on that very first trip that I did on the Omo. Up to that point, we thought the hippos were just big, timid, run-from-you creatures. But all of a sudden we discovered that they were pretty vicious. The hippo that grabbed my boat, he shook our boat like a dog shakin' a rag. We were lucky we could hang onto the boat. I mean, it was such violent shaking, he was throwing the boat around. I'm sitting' in the middle, and he's got his big ol' jaws clamped onto the boat, right at the oar lock. And the oar lock is holding' up one of his gums, so I can see into his teeth. I could reach out and touch him on the nose. Mean-lookin' eyes, you could hear the air escaping' and the boat startin' to deflate around us. Then you could see the hippo was done shaking us, and he was trying to get away, but his teeth were stuck in the material of the raft because those boats were Vladimir's first early…the Holcomb boats. Yeah, these were new Holcomb boats to start out with. (Steiger: Which they didn't hold air all that good, right?) They didn't because just before that trip, we'd done the Gaba River and lost them all, and then retrieved them. When we lost 'em on the Gaba, they had gotten all pinned on one rock, and just shook in the force of the water for a week before we got 'em out. And then we patched 'em all up and went down the Omo with 'em. So they already didn't hold air. But now mine really didn't hold air. (Steiger: Those were hard to patch, too.) Well, we used every bit of glue and patchin' material that we had, to put my boat back together. A week or ten days later when John Yost's boat got bitten by a hippo, by the second bite we had no glue and no patchin' material, no way to repair it. So we just had to abandon that boat because it was toast.(32)

SPECIAL APPRECIATION:

- Partial funding and support from the University of Utah, Marriott Library, Utah River Running Archives, Salt Lake City, UT
- Funding by Val & Herm Hoops, oneway boatworks, P.O. Box 163, Jensen, UT 84035
- George Aragon, Doug Tims, & Mike McLeod - Maravia

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{1st draft 02/15/12 - 448 words; #2 12/07/2014 - 6578; #3 12/10/14 - 7980; #5 8/1/15 - 10238; 102015 - 11210; 03/24/2016 -11862; 2017 - 12,411}