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The History of Rubber Boats and How they Saved Rivers by Herm Hoops 2009

Rubber has been part of human history for ages but the industrialization of rubber was an important part of the evolution of river craft. Without rubber it is unlikely that we would have our modern inflatable boats to use in running rivers and it is likely many of our rivers would have been silenced behind dams. A combination of events led to the development of rubber inflatables that river runner's use today.

There is only one kind of natural rubber. The rubber plant only thrives in hot, humid regions near the equator in Southeast Asia and Africa. World War II cut the United States off from rubber supplies and the production of synthetic rubber from oil was increased for the war effort.

Today most rubber is a synthetic product made from crude oil. There are about 20 grades of synthetic rubber and the intended use determines the process and chemicals involved in production. In general, to make synthetic rubber, byproducts of petroleum refining called butadiene and styrene are combined in a reactor containing soap suds. The latex is coagulated from the liquid and results in rubber "crumbs" that are melted into the final product.

Ancient images of animal skins filled with air used as floats to cross rivers are the first records of inflatable boats. In 880 BC Assyrian King Ashurnasrpal II ordered his troops to cross rivers on greased animal skins which they inflated.

The Mayan people of South America made and used rubber latex to make rubber balls, figurines, bindings and in other applications. Latex is the sap of the Hevea or rubber tree, and when exposed to air it hardens into a springy mass. The Mayans learned to mix the rubber sap with morning glory vines to make it more durable and elastic.

By 1736 rubber had made its way to Europe, and in 1791 Englishman Samuel Peal discovered that by mixing rubber with turpentine he could produce a waterproof cloth. Soon after, inventor Joseph Priestly found that rubber could be used to erase pencil marks on paper. But rubber was subject to weather conditions. If the weather was hot and sticky, so was the rubber and in cold weather it became brittle and hard.

In 1837 rubber had its first practical application in the industrial world when American Charles Goodyear accidentally dropped rubber, lead and sulfur on a hot stove top, causing it to char like leather yet remaining plastic and elastic. The resulting substance wasn't affected by weather, and would snap back to its original shape if stretched. The process was refined and uses for rubber materials blossomed. This new rubber (not patented until 6/15/1844) was resistant to water and chemical interactions and it did not conduct electricity, so it was suited for a variety of products.

In 1839 vulcanization, a refined version of this process where the rubber is heated under

pressure, transformed the white sap from the bark of the Hevea tree into an essential product of the industrial age.

Around 1837 John MacIntosh used Goodyear's technology to develop a small rubber boat with leggings in its bottom for amphibious-like use (U.S. Patent #462). In his patent application he claimed that, "this life-boat may be used for the saving of persons and property, for the conveyance of troops across rivers." In 1840 Englishman Samuel White created a rubber hat that doubled as a life preserver.

In the mid 1800's, naval and army personnel from both England and the US started to create inflatable flotation devices to cross rivers. In 1839 the Arthur Wellesley, the 1st Duke of Wellington, tested inflatable pontoons to bridge rivers in Europe.

In the 1830s lieutenant, John Foote Lane was supervising the Army occupation of former tribal lands in the South and transporting tribes to the West. He spent 1835 in Washington in the quartermaster corps where he won honors for his invention using India rubber pontoons for military bridges over the Delaware River. Lane attempted to use some of the pontoons in the Florida Seminole wars with little success. In 1840 the patented pontoon boats were lashed together for bridge building during the Second Seminole War.(18)

Prior to the Mexican War there were no organized temporary bridge "trains" in the U.S. Army. General George W. Cullum designed a bridge that rested on inflatable pontoons to cross rivers in 1848. Two "trains" of India Rubber pontoons were used by the army in the Mexican War. They were later sent to West Point to instruct cadets and engineers. By 1858 they were unserviceable because the vulcanized rubber had deteriorated. After several years inflatable pontoons were abandoned in favor of the French wooden and Russian canvas-covered pontoons.(20)

In 1840 Englishman Thomas Hancock, designed an inflatable craft he described in "*The Origin and Progress of India Rubber Manufacture in England.*" In 1844 - 1845, British naval officer Lieutenant Peter Halkett developed two types of inflatable boats. A Halkett boat is a round shaped, lightweight, inflatable boat. Halkett had long been interested in the problems of designing boats light enough to be carried over arduous terrain, but robust enough to be intended for use by Arctic explorers. Halkett's boats were made of rubber-impregnated "Mackintosh," a waterproof raincoat, first sold in 1824. The "boat cloak" served as a waterproof poncho until inflated, when it became a one-man boat. A pocket held a bellows, and a blade to turn a walking stick into a paddle. A special umbrella doubled as a sail. Halkett also developed a two-man boat that was carried in a knapsack, and could serve as a waterproof groundsheet.

Halkett's designs had a limited market, and he was unable to persuade the Royal Navy that they would serve any useful purpose, and efforts to market them as platforms for fishing and duck shooting failed. Only a single Halkett boat, that of explorer John Rae who surveyed parts of the Northwest Passage and discovered the fate of the Franklin Expedition is known to survive today.(9) The French had their own version of an inflatable boat designed by Clement Ader. In 1842 John Charles Fremont purchased a rubber raft from Horace H. Day for \$150 and used it

for the Platte River survey. The inflatable was described as being twenty feet long and five feet wide in a rectangular shape.(5) The boat, laden with a cart and equipment, and paddled by three men made six successful crossings of the Kansas River near Topeka. It was loaded with two carts on the seventh trip and promptly flipped.(6) Fremont's survey began at the confluence of the Sweetwater and North Platte Rivers. The inflatable was loaded with seven men, twelve days of provisions, and the equipment and dunnage for the trip. On the flat water of the Platte, Fremont reported the boat handled 'light as a duck on the water.'(6) As the survey continued, they encountered rough water and flipped the raft, under what is now Pathfinder Reservoir, scattering their gear down the river. He wrote: "had our boat been made of wood, in passing the narrows she would have been staved; but her elasticity preserved her from every shock."(6)

In January 1846, Horace Day received patent #4,356 for the craft. Day's patent papers described it as "forming the boat of a sheet of India rubber for the bottom extending around and attached to hollow cylinders of India rubber cloth connected together by their ends to form the outer frame."(5) The patent showed a four-sided rectangular craft, but it noted a sharper bow could be made by using additional cylinders. In Day's design "The ends of the cylinders are closed to avoid the necessity of uniting the ends of the several cylinders with water tight joints."(5) The floor was wrapped up and over the outside of the tubes, a practice that was not used on commercially produced boats until the military assault inflatables of the 1940's. On Day's craft, boards could be placed on the floor to keep the floor from sagging down from weight.

In August of 1844 Fremont, trapper and guide Kit Carson, map maker Charles Preuss and seven others planned to paddle an inflatable boat made of India gum rubber from the mouth of the Weber River to an island in the Great Salt Lake. The \$300 boat was eighteen feet long and pointed on both ends.

On unpacking his boat Fremont discovered that instead of being strongly sewn like the one used a year earlier in exploring the canyons of the Upper Platte River, this boat's air cylinders had been poorly pasted together by a manufacturer rushed for time. At sunrise the rubber raft was inflated. When two of the cylinders leaked and threatened to sink the boat, one man constantly had to work the bellows while the others rowed. Midway to their destination as the wind grew stronger the air cylinders started to collapse. At last, the boat made it to the island beach. For the men boarding the "miserable rubber boat" returning to the Weber River was a challenge. Carson's recollection was understated, he wrote: "*We had not gone more than a league, when a storm came up.*" "*The boat was leaking wind.*" (1)

By 1851 Charles Goodyear had won numerous awards for his designs of inflatable boats, self inflating boats (sprung open with whale baleen), pontoons with multiple chambers and other designs. In 1851 Goodyear Rubber displayed the first pontoon made of India-rubber in London.

In 1853 artist H.B. Molhausen sketched an inflatable raft used by Lieutenant Amiel Whipple of the U.S. Army Corps of Topographical Engineers crossing the Colorado River near Fort Mojave. In 1855 the Thomas Hancock Company in Britain developed a series of modern-looking inflatables.

During the European Wars and American Civil War of the 1860's destruction of bridges was a defensive tactic in a country veined with numerous streams and rivers. Temporary bridges were built from wooden boat-like pontoons decked with timber. It took some thirty-four pontoon wagons, twenty-two wagons hauling planks and timbers, four tool wagons, two traveling forges and a supply train of more than twenty wagons of a cumbersome "train" that stretched for miles. As the war went on, collapsible, canvas-covered pontoons were deployed, increasing the capacity of bridging trains, but the lengthy pontoon column still caused havoc. The delay of pontoon trains for crossing the Rappahannock River at Fredericksburg, Virginia lost Union General Burnside the initiative and thousands of lives.

In 1861 Col. Barton Alexander began looking into the Army's use of the India rubber pontoon bridge.(19) Although in 1863 the U.S. Navy began using inflatable life rafts on its ironclad warships, the use of inflatable pontoons for temporary bridges had yet to gain acceptance. The Army had been experimenting with George W. Cullum's design of inflatable pontoons as early as 1846. But in 1851 the Goodyear Rubber Company had produced an India rubber inflatable bridge pontoon and the U.S. Army showed interest in Goodyear's pontoon design.

Originally the inflatables were made of double thick India cloth coated with rubber, glued together and baked in an oven to vulcanize fabric, coating and adhesive. The ends were tapered and the tubes were twenty feet long and twenty inches in diameter. Each section of the bridge rested on three pontoons secured by a forty-five-pound anchor. Each section of pontoon could support 7,000 pounds. If damaged it was easily repaired with a rubber patch. This type of inflatable pontoon was used by General F.P. Blair in the Vicksburg, Mississippi Campaign. It was also used successfully to cross, and retreat back across the Saline River in the Arkansas Red River Campaign.(8)

In 1866 four men crossed the Atlantic Ocean on an inflatable raft named Nonpareil.(7) The *London Star* reported: "The American life-raft Nonpareil, forty-three days from New York, arrived at Southampton on Thursday, 25th July." "She is only 24ft long and 12ft broad. The raft, which has two masts, consists of three cylinders, pointed at each end, united together by canvas connections" "There is a smaller raft on board for use as a boat. The raft has kept perfectly water-tight all the way, not a leak of any sort having occurred. She is fitted with an apparatus for filling the tubes with air."(21)

In 1888 John Boyd Dunlop invented the pneumatic rubber tire.(10) By 1892, there were many rubber manufacturing companies in Connecticut. Nine companies consolidated their operations in Naugatuck to become the United States Rubber Company.(11) Dunlop and U.S. Rubber went on to be major producers of inflatable life rafts and bridge pontoons for military use in WWII and the Korean Conflict.

Around 1900 the advances of rubber manufacturing made it possible to build more durable rubber inflatable boats. But these crude craft had inherent defects and they tended to split at the seams and folds due to less than optimal manufacturing of the rubber.

German Albert Meyer developed a new, and better inflatable boat design in 1913. His company marketed it as a “pneumatic boat” and they were in common use by the German Army by 1920.

The loss of lives on the Titanic and the World War I loss of ships to torpedoes created a demand for more lifeboat capacity on oceangoing ships. Passenger ships had a difficult task to carry additional lifeboats and they had to stack lifeboats one on top of each other to save the limited deck space. Although Goodyear had discovered a better way to manufacture inflatable life rafts between the two World Wars their use had not been implemented. His inflatable life rafts (actually developed by employee Ward Van Orman) were square-shaped inflated rubber cylinders with a rigid floor.

In 1919 Reginald Foster Dagnall tested inflatables on a lake in England and that year British Zodiac claimed patents for the first modern inflatable boat, the ancestor of the one-man life raft. In 1919, Firestone Tire and Rubber Company of Canada was incorporated in Hamilton, Ontario. At one point, the company had a rubber plantation in Liberia that covered more than one million acres. During World War II the company was called on by the U.S. Government to make rubberized inflatable military products.(10)

Amos Burg used a small inflatable boat to float the Alaskan Bell and Porcupine Rivers in 1929. In 1934 Pierre Debroutelle designed an inflatable kayak. In 1937 he designed the now traditional U-Shaped inflatable for a company that would later become Zodiac. It was the first boat of its kind to gain certification from the French Navy. Later in 1943 a wooden transom was patented (patent August 10, 1943) to accommodate a motor on the Debroutelle style boats built by Zodiac.

The first known use of an inflatable raft on the Colorado River System was by Amos Burg who used a custom-built eighty-three pound rubber raft named “Charlie.” In 1938 Buzz Holmstrom and Amos Burg duplicated Buzz's 1937 solo trip down the Green and Colorado Rivers to make movies of his previous famed adventure.

An airman named Patten died in 1934 when his plane crashed into the ocean during maneuvers. The pilot had no life raft and died because he was unable to survive the sea until a rescue arrived. In 1939 his brother, Fred F. Patten, joined the navy and pioneered the development of one-man life rafts to save pilots. Soon after Pearl Harbor the Navy and Army Air Force adopted Patten’s prototype life raft that was produced by the U.S. Rubber Company in Rhode Island.

In 1942 Patten, who worked for U.S. Rubber, was approached by the Army to produce life size inflatable decoys of B-26 bombers. Before the Normandy invasion thousands of inflatable decoy tanks, trucks, artillery, planes and one-hundred and ten foot long landing crafts were deployed near Dover, England to lead the Germans to expect the Allied invasion of Europe at Calais, France. In the late 1950's Special Forces adopted a Patten design of an inflatable drop stitched floor for rough water transit. Patten was likely the first to incorporate this feature in inflatable boats.

Between the World Wars a joint venture by Polish immigrant Stanley Switlik and George Putman (Emelia Earhart's husband) started the Switlik Parachute Company. The company continued development of new products including the "Mark II" life vest for the Navy in 1947. In 1949 inflatable one-man life rafts were developed and sold to the Navy. In 1951 Switlik manufactured a large quantity of 20-man life rafts for the Air Force.

By World War II new synthetic materials were invented and used that revolutionized inflatable boats. The refinement of neoprene, a synthetic with excellent air holding capabilities, combined with a manufacturing process that impregnated a cotton inner fabric with neoprene allowed boat tubes to have more rigid and various shapes. The rubber and manufacturing process was significantly better than the prior 35 years, the inflatable returned, but this time it was boat-shaped.

On entry into World War II the United States recognized the importance of pontoons to cross Europe's rivers and small infantry craft to infiltrate and assault the enemy's coast. Army engineers, faced with transporting large wooden pontoons and boats across the Atlantic and Pacific began to look at inflatable rubber as a solution. Designs were made for pontoons and small 7-man boat-shaped assault rafts capable of using a motor or being paddled. In WWII inflatable, collapsible military pontoon bridges (described in detail in US242383 patent 1947) were in common use. The air compartment is a supporting element in the construction (described in patent CA886879).

Submarine warfare in the Battle of the Atlantic led to casualties on warships and merchant ships. US warships began using rubber life rafts and they were used on submarines where space was limited. They allowed troops to make landings in shallow water, and their compact size made overland transport possible. In August 1942 the submarines USS *Argonaut* and USS *Nautilus* carried elements of the 2nd Marine Raider Battalion in a Makin Island raid using inflatable boats. Invasions of the Battle of Arawe by the 112th Cavalry Regiment and parts of the Battle of Tarawa involved amphibious landings in inflatable boats against heavy enemy resistance. Inflatable life rafts were also used to save crews of aircraft that ditched in the sea. The PBY Catalina was the first airplane to have an inflatable rescue life boat aboard. (16)

There was another advantage of using inflatable boats in the war. The craft were inflated to a low pressure of 2-4 pounds per square inch. They would deflate slowly if struck by an enemy bullet and multiple chambers allowed the boat or pontoon to continue to float while repairs were made. In the 1930s and 1940s much of America was mostly rural. Many town and farm boys had become familiar with patching leaking tire tubes and the repair of rubber was relatively easy to teach. A GI or Engineer didn't have to be a wood craftsman to repair a rubber boat.

In the 1950s, French Navy officer and biologist Alain Bombard was the first to combine the outboard engine, a rigid floor and a boat shaped inflatable. The former airplane manufacturer Zodiac built the boat and a friend of Bombard, diver Jacques-Yves Cousteau, began to use it after Bombard sailed his inflatable across the Atlantic Ocean in 1952. Cousteau liked the shallow draft and performance of the Zodiac and he used it as tenders on his expeditions. The inflatable boat was so successful that Zodiac lacked the manufacturing capacity to satisfy demand. In the

early 1960s, Zodiac licensed production to a dozen companies in other countries. In the 1960s, the British company Humber began mass production of Zodiac brand inflatable boats.

The Zodiac inflatable boat, grew to be popular with the military and contributed significantly to the rise of the civilian inflatable boat industry, both in Europe and in the United States. In the United States U.S. Rubber, Goodyear, Uniroyal, B.F. Goodrich and Dunlop produced significant quantities of inflatable boats and pontoons. Many of these companies eventually subcontracted their inflatable products to Rubber Fabricators, Inc. of West Virginia after 1954.(12)

The Korean Conflict further highlighted the use of inflatable boats. Raids by British Commandos and US Special Operations Group in the 1950's became common. A towrope attaching the black rubber raft to a landing craft (LCPR) was used to haul the rafts and men toward a landing site. A British writer who accompanied one mission wrote:

“Cut loose they paddled towards land. The silence grows half-perceptibly into sound, the rhythmical swish of surf. ... For a second or two we are caught violently in a chaos of foam. We hit something solid: "Out, quick, get out Come on, for Christ's sake!" It is an urgent but not quick task to drag the boat up to [the beach]; no tug-o-war team ever heaved so desperately.... A new, temporary bridgehead is established in North Korea...” (2)

After World War II, and the Korean Conflict thousands of rubber boats and pontoons became available to the public through military surplus sales. In 1948 Don Hatch convinced his dad, Bus to look into the military surplus sales in Salt Lake City. Among the many surplus items were inflatable bridge pontoons, 7-man and 10-man inflatable rafts.

“Bus and Don realized that here was a replacement for the wooden river boat. The inflatable rafts were cheap - only \$25 each for the 10 man, less for a seven man - and they were virtually maintenance free. With an inflatable raft, you could carry twice as many passengers, and do it in comfort. If you hit a rock, it usually bounced off. They required no varnishing or repairs beyond a patch or two now and then, and when the river season was over you could just roll them up and store them away. And they were so cheap that a man could afford to have a fleet of them.”(3)

Albert Quist of famed Moki Mac River Expeditions in Green River, Utah was another early fan of the inflatable boats. He, John Cross and Malcom Ellington began taking Boy Scouts through Glen Canyon shortly after World War II. About that time, Roy DeSpain also began using the inflatables on the Upper Green and Yampa Rivers. In an article about the inflatables Don Hatch wrote:

“They handle extremely fast. They pivot, slide slip, and perform many other antics not usually possible with other boats. An empty ten-man raft with a good set of oars can be made to almost leap out of the water with one good hard stroke. They turn and dodge like little water bugs. This is possible because they draw less than three inches of water - loaded! They bounce off rocks like a billiard ball striking a cushion. When they pound through big waves and holes, their low center of gravity helps tremendously to keep them upright.” (4)

At a time when river running was considered a mere stunt, enterprising outfitters began

experimenting with the surplus inflatable assault craft and bridge pontoons and advertising commercial river trips. The surplus inflatable assault boats and bridge pontoons were cheap and plentiful and river outfitters began experimenting with their possibilities.

Paul T. (Pablo) Thevenin remembers those World War II “bridge building pontoons that became the 28 footer and 33 footer boats: “I remember picking them up (surplus) for \$10 to \$20 a piece, some in mint shape. These were the old “rotten cotten” ones that blew out on a hot day.” “The big change came when we started getting the short snouts from Korean War. I think Jack Curry was the first to buy those, and we had to figure out what to do with them, thus began the J-Rig and other snout rigs which I was involved. With the old WW2 and Korean War pontoons we always carried at least a gallon of glue and yards of patching material. It was not unusual to see a boat explode while parked on a beach at lunch time, any major scrape on a rock indicated a need for repair. One of the side issues, besides the quality of the rubber in the first pontoons was the valve issue where valves would easily cross thread and leak air like mad.”(13)

Jack Curry (Western River Expeditions) thought he had made a real deal when he purchased two railroad boxcars full of surplus bridge pontoons in 1965. Jack thought he was getting the oblong 33 foot bridge pontoons similar to those used in WWII, but instead what he had purchased were 22 foot long, 36" diameter straight tubes (Snouts). Paul Thevenin was dispatched to unload the rubber in Salt Lake City. He kept digging through the pile looking for the round 33' pontoons, but there were not any there. Paul began experimenting by gluing the tubes together end to end, and side by side. Jake Luck built a frame that spanned the longer tubes Paul made. Thus Paul and Jake made the first “J” Rig, which came to be named for Jack Curry.(14)

Curry didn't know what to do with all the excess tubes so he put them up for sale. In 1969 Dick McCallum (Grand Canyon Youth Expeditions) experimented by spreading the big tubes apart and spanning them with a frame that had two oar stations and a sweep oar at the stern for steering. One boat carried eight people and gear for a 22 day Grand Canyon trip.(14)

Dick's creation inspired Allan Wilson (ARTA) to build a one oar station craft. Wilson rowed his design through the Grand Canyon and soon ARTA had a fleet of Snout Rigs. Jack Kloepfer (Jack's Plastics) saw a Snout Rig named Moms Apple Turnover on his first Grand Canyon trip in 1972.(14) Western River Expeditions took the idea of the J Rig and miniaturized it into a rowing platform that was 28' long and 12' wide on four 36" diameter tubes side by side.(14)

Improvements to neoprene and hypalon fabrics in 1953 made inflatables more reliable. For a few years there were still many of the early “war surplus” inflatables available, and the cotton fabric boats continued their appearance as river craft.(15) It was not until the mid-1960's that outfitters like Ron Smith (Grand Canyon River expeditions), B.A. Hanten (Rogue Inflatables) and Dick Barker and Frank Ewing (Barker Ewing Float trips) began designing inflatable boats specifically for running rivers.(22)

By 1971 the British company Avon was established and producing inflatables but they were expensive. The Craighead Brothers, in Jackson, Wyoming began using the Avon rafts and the company recognized the potential in manufacturing river rafts. In 1971 Avon introduced the Adventurer (13' long x 6'6" wide with 17" tubes - cost \$875.) and the River Professional MKII (15' long x 6'8" wide with 18" tubes- cost \$1200). But these boats were small and did not carry the number of passengers or load for outfitting multi-day river trips. Soon a number of different companies began producing river inflatables, primarily for non-commercial use as peoples interests in doing their own river trips increased. Newco, a manufacturer of military rafts, began sales of an expensive line of nylon boats. At the other end of the spectrum, Udisco manufactured a very light, inexpensive raft that many people began their river experience with.

The inflatable boats & pontoons made a marginal business more profitable as because they allowed outfitters to carry more customers and gear in each boat than the older wooden river boats. As the controversy to build a dam at Echo Park, within Dinosaur National Monument spilled into the national press headlines, the National Geographic Society and Sierra Club began sponsoring trips down the Yampa and Green Rivers. In 1953 more than 200 Sierra Club members took six-day raft trips down the Yampa and Green Rivers in Dinosaur National Monument and the Club produced "Wilderness River Trail" to promote saving Dinosaur's spectacular river canyons. The magazine and newspaper articles the trips generated showed that river running was a legitimate sport, and with a seasoned guide could be enjoyed by anyone. The articles showed Americans the magnificent vistas, sublime beauty and challenging rapids of the canyons.

Within a few years the inflatable boats used in commercial river running brought thousands of people to the rivers and canyons. The river tourists and the organizations to which they belonged wrote letters of protest and united against the desecration of magnificent rivers and inspiring scenery through which they passed. In a sense it was the inflatable raft that saved places like Echo Park, the Yampa River and Grand Canyon for our enjoyment today.

{SIDEBAR:}

The process of building inflatable boats was refined to adhere the air holding neoprene on the inside of the cotton inner fabric and the more durable hypalon to the outside. Unfortunately when the cotton inner fabric was exposed to water from cuts or tears, it began to deteriorate - causing a defect known as dry rot and the craft became unserviceable. As long as the fabric remained intact, and repaired quickly the material remained durable.

Today fabrics have nylon or polyester as a base that overcomes the problems created by cotton. Neoprene and hypalon still command a significant portion of the river boats produced because of their durability. Other fabrics like PVC, thermoplastic urethane, unsupported bladders and other materials have also found a place in the river boat market. Each has its advantages.

CUT DOWN BOATS & MISS PIGGY

Glade Ross, Utah River Guide License is 0001, has been running rivers for a long time. He was one of the early Grand Canyon River guides for Hatch River Expeditions before he became a ranger with the National Park Service. Glade was the N.P.S. Ranger at Lodore since before 1972 until he retired in 1996. Here is a story told to me by Glade:

Frank McKnight was rowing a 28' National Park Service donut pontoon boat down Lodore Canyon on the Green River, doing some welding on culverts and other work. He wrecked the boat in Hells Half Mile and lost everything, including the acetylene tanks. The boat wrapped and attempts at salvaging it were unsuccessful. Several weeks later the boat washed off and was recovered, it was tossed in the N.P.S. boneyard and sold for salvage. Ron Smith bought it even though the floor was completely gone and the middle tubes were trashed.

In 1963 or 64 Glade Ross saw the boat at Smith's boathouse and offered to buy it. Smith's reply to Glade was "what do you want that thing for!" Smith sold it to Ross for about \$10. Glade cut out the middle air chambers so that the baffles of the ends were left intact, with about 4" of extra fabric. He then punched holes in extra fabric and stitched the two ends together. There was no floor and "the only way you could put a floor in it was to hang a piece of plywood on chains."

Jack Curry saw the boat and liked it. By then 28' boats were no longer available, so he bought Korean War 33' boats and began cutting and splicing them. About the same time the Hatches were using similar self-bailers on the Salmon River in Idaho. Previous to that many boaters hung plywood floors on boats, but only to give the floor cargo strength, the rubber floor was left in place.

In the late 1960s Glade, along with the Hatches built another boat with "no floor": A plywood floor hung above the water with chains. It was called "Miss Piggy" because its extremely high tubes and short 18' length gave it the resemblance of the TV character. That boat was vulcanized together using the Hatches vulcanizing machine. It was used by the National Park Service in Dinosaur National Monument until 1994, when it was tossed into the N.P.S. boneyard and eventually sent to the landfill.

{Interview with Glade Ross by Herm Hoops; February 20, 1996; Confirmed by a Don Hatch story to Herm Hoops in 1988}

Earl Perry loved Miss Piggy – especially her 13' handmade oars. Glade took 4 x 4s and split one end of them and bolted in a piece of plywood for a blade while the handle end was simply whittled down like a giant pencil. They were hard to grab on to, so I duct- taped river rocks to counter balance the oars. It worked ok until you had to row hard and the rocks would slam into your knees. Also had the funky 1 ¼ inch pipe sticking out of the frame and a piece of fire hose clamped to the oar as an oar lock – actually worked pretty good. The frame and boat weighed a ton – frame made out of 2 x 8's, and a #4" marine plywood floor hung by heavy chains. But she could hold literally tons of gear – we carried many an outhouse kit in as well as those "firepans" Earl had us place in the campgrounds – they really were solid steel army surplus griddles and weighed 238 lbs a piece. We carried in four or five of them on Miss Piggy.

{Told to Herm Hoops by Bob Ratcliffe February 02, 2012 (ex Hatch Boatman, Dinosaur River Ranger, BLM Deputy Assistant Director)}

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- (15) Interview with Dave Demaree; Herm Hoops; 3/14, 2011
- (16) KUSA TV Tuesday, December 14, 2010, 12:54 PM
<http://link.brightcove.com/services/player/bcpid34762914001?bctid=672454611001>
An entire crew of a B-29 (12 aviators) floating in a liferaft were rescued by a U.S. submarine after their plane was shot down in 1944, 70 miles off the coast of Japan. The entire rescue was filmed in color but then sat in a guy's closet until 2011.
- (17) Zodiac S.A.; 2 rue Maurice Mallet, 92137 Issy-les-Moulineaux, Cedex, France; (Avon has been a division of Zodiac Marine of France since 1998).
- (18) *The History of Fort Mellon and the Second Seminole War*; Christine Kinlaw Best; p94;
- (19) *Civil War The metal life car: the inventor, the impostor, and the business of lifesaving; Scientific American*; July 11, 1863; p133; George E. Buker;
- (20) *International Congress of Engineers*; 1895; p622;
- (21) *The Life-Saving Raft "Nonpareil"*; *The London Star*; Sept, 1867;
- (22) Interview with Dick Barker, Frank and Patty Ewing & Heather Ewing; Herm Hoops; 1/20, 2012

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