

Chronology of Snow Grooming
Notes for 2001 Exhibit, New England Ski Museum
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The following notes on snow grooming are intended to aid in the development of a Ski Museum exhibit. In many cases it is unclear from the sources referenced below exactly when a particular machine or practice was first invented or instituted. It is also probable that sources with data on certain early inventions was not located. It is therefore not possible to determine which machine or practice was "the first" of its kind; rather, this chronology is intended to indicate the general sequence of the development of snow grooming.

1907 "Lieutenant Shackleton modified an Arrol-Johnston automobile. The skis were removable and the rear wheels were more like cogwheels. He travelled to within 150 km of the South Pole with this machine" (Bombardier Foundation, p. 58).

"By car to the South Pole is the title of an article in the October 1907 issue of The Car and shows a photo of Shackleton's Arrol-Johnston made in Paisley, Scotland. It has a 4-cylinder 12-15 hp motor with Bosch magneto ignition, is air-cooled and has a 4-speed gearbox. A pipe from the exhaust goes to the carburetor and passes under the floor to act as a foot-warmer; finally it leads through a small tank for melting snow for cooking...The front wheels had solid rubber tyres and detachable runners are slipped under them" (Lorch, p. 76).

1913 "Virgil D. White of New Hampshire invented what was possibly the earliest oversnow vehicle. It was a modified Ford with skis attached to the front. Both sides of the machine had cleated traction belts which were powered by the rear wheels and looped around them and an additional set of wheels mounted on the back which served as idlers...Wright worked on these modifications for several years perfecting the details before the machine was marketed in 1922" (Gray, p. 523).

1922 "Armand Bombardier built the first propeller-driven snow vehicle; at about the same time, E.M. Tucker invented a unique spiral or auger-type traction system in which two spiral augers were mounted on cantilevered springs parallel with the direction of travel. An air-cooled engine powered the augers with most of the weight being carried on three skis. In 1926 the drive was reduced to one spiral" (Gray, p. 523).

1926 (Summer) Joseph-Armand Bombardier opens his garage in Valcourt, Quebec. "His goal had not changed: he still dreamed of adapting the automobile to winter conditions...to build a motorized vehicle to replace horse-drawn sleds" (Lacasse, p. 21, p. 30).

1926-1936 Bombardier works on three technical problems of snow vehicles; weight distribution, drive system, and suspension system (Lacasse, p. 32).

1927 Carl J. Eliason, a forerunner in the field of snowmobiles, obtained a patent for a track-driven motorized toboggan. During the next five years, he sold 40 at a unit price of \$360" (Bombardier Foundation, p. 57).

1930s "The Eliason Motor Toboggan was developed in the 1930s, consisting of a cleated track suspended through the bottom of a toboggan, powered by a motorcycle engine. Front twin runners were used to steer the toboggan, which had good speed, but little ability to climb steep slopes" (Gray, p. 524).

Mid 1930s "The Tucker Sno-Cycle, developed during the mid 1930s became one of the better-known American oversnow vehicles. An automotive engine, transmission and differential was used to bring power to an open link endless track on roller bearings. The machine was supported on the snow by oblong steel pontoons around which the track was driven by metal sprockets" (Gray, p. 527).

1936 (Summer) "That summer, (Bombardier) began building a wooden form to cast a new sprocket wheel in iron and nickel. A sheathing of rubber reinforced with cotton would be bolted to the wheel. He also made a new drive and suspension system for the rear end of the vehicle; it included parallel bars supporting a number of wheels with tires and linked to the chassis by means of leaf springs. A lightweight cabin made of plywood completed the new vehicle. The B7 was born" (Lacasse, p. 35).

1936 (December 21) Bombardier files for patent rights on rubber-encased sprocket wheels, tracks with two rubber belts and steel struts, flexible suspension with parallel bars. "These devices have made general transportation possible on snow and on soft and waterlogged terrain. Since patent rights expired in 1954, these devices have been used by other companies making vehicles for similar purposes" (Lacasse, p. 37).

1936-37 (winter) Bombardier produces and sells eight B7 vehicles (Lacasse, p. 36).

1937 Bombardier closes his garage and concentrates on making over-snow vehicles (Lacasse, p. 38).

1939 Bombardier produced fifty B7's. "Most of Armand's first customers were country doctors. Next on the order books came the names of taxi and bus owners, public utilities such as power and telephone companies, innkeepers, veterinarians, and logging contractors" (Lacasse, p. 52).

1940s "In the 1940s E.M. Tucker developed the Sno-Cat which Sir Vivian Fuchs used to cross the Antarctic in 1957" (Bombardier Foundation, p. 57).

Early World War II "The need for oversnow vehicles by the military resulted in the development of the first metal-track oversnow vehicle, the M-7. This vehicle had a two passenger cab mounted between two tracks consisting of metal pads fastened together with rubber-clad cable. The tracks were driven by large, rubber-coated sprockets. The power unit was a conventional 4-cylinder water-cooled jeep engine with power being transferred to the sprockets through a conventional transmission and modified differential. Various grousers for the M-7 were tested under different snow conditions" (Gray, p. 525).

World War II The "Weasel" having a power supply drive and track assembly similar to the M-7 was also developed in World War II. Larger than the M-7, it had a seating capacity of four to six passengers, and had a different steering mechanism incorporating a clutch-brake assembly for each track" (Gray, p. 526).

1942 Tucker Sno-Cat's first year in business, according to 50 year ad in 1992 (SAM, September 1992, p. 37).

1942 (spring) " ...a research committee was organized in Ottawa. It included engineers and technicians from the army, from various government departments, and from private companies with expertise in the matter, including Studebaker Corporation and BF Goodrich Tire and Rubber Company. Under the direction of Dr. GJ Klein, the committee designed a snowmobile called the M29, which was nicknamed the Weasel because of its shape. The designers of the M29 encountered the same problems that Armand had worked so hard to solve between 1926 and 1937: ice accumulation of the tracks, tension on the sprockets, weight distribution in contact with the ground, and location of the vehicle's center of gravity in relation with different types of terrain "(Lacasse, p. 63).

1943 (Winter) Article on snow grooming by Phil Robertson appears in Eastern Slope Regionnaire, featuring photo of Weasel with enclosed cab pulling Magic Carpet. Building base by packing snow and breaking up ice with farm equipment stressed (Regionnaire, Winter 1942-43, p. 11).

1945 (November) "The C18, a snowmobile capable of carrying up to twenty-five students, went on sale....During the 1940s, Bombardier snowmobiles were particularly useful in isolated areas, where students had to be brought to a central location "(Lacasse, p. 96).

Mid 1940s "Ross Eskelson and the Utah Scientific Foundation developed the Eskelsled which was powered by a motorcycle engine which drove a single-cleated track mounted around the frame and steered by a front ski." (Gray, p. 531).

1946-1958 David A. Gregg II was a distributor for Tucker Sno-cat in Nashua, NH. The vehicles came by rail from Oregon and were stored at the White Mountain Freezer Co. Each Tucker that Gregg sold was numbered (some of these numbers are visible in photos in collection). FE Nadeau and Sons, a welding shop in Nashua, made rollers, carpet drags and ski toboggans. (Gregg).

Post war: Stowe had one or two surplus Wesels and one of the earliest Tucker Sno-Cats, and also a home-made machine. Culvert rollers with concrete were used to roll. A chain-link mat cruder than a magic carpet was also used. Mostly beginner to intermediate terrain was groomed, never the Nosedive. Shovel crews were used on the mountain as well, and would slide downhill on shovels after job was done. (Brian Linder phone interview 12-12-01)

1947 (Dec) "Tucker Sno-cat made its debut in the East at Big Bromley....It is interesting to note that the main use for these snow vehicles seemed to be in their "ideal" application as uphill transportation for spectators. Even as late as February of 1950, trail grooming was still done primarily by large packing crews. After a sixteen-inch snowfall, Bromley was noted as having a thirty-member packing crew working on the slopes.... During that first winter (1947-48) Bromley introduced Sno-Cat Tours to pull spectators all over Peru Mountain. There were two of these army-pioneered Sno-Cats. One was promoted for smaller parties with seating up to four passengers; the other was a converted freighter holding up to ten people with twenty-five more possible in its trailer. The Sno-Cats would make regular trips to the mountain top where visitors could marvel at the three-state view and watch the skiers arrive by J-Bar. On the way down, the tour would follow regular trails and make stops in the open meadows where the riders, by watching the skiers, could share vicariously in the winter sport." (Pabst, p. 35-36).

1947-48 "First, the winter of 1947-48 was without snow in Quebec. ..Lack of snow caused snowmobile sales to plummet. A second severe blow came in the form of a provincial law, adopted in the spring of 1947, which committed government authorities to keeping the main highways open to traffic all winter long and to assisting municipalities in doing the same for local roads"(Lacasse, p. 99).

Late 1940s "By the late 1940s the (Utah Scientific) Foundation achieved some success with several models of a vehicle, called the Frandee, which was equipped with a tandem, cleated, endless belt track around idler and drive wheels, and used either brake of ski steering" (Gray, p. 531).

Early 1950s "A later adaptation (of the Tucker Sno-Cycle) called the Tucker Kitten was developed in the early 1950s, but did not perform as well as the M-7. A large, four-pontoon Tucker Sno-Cycle (Tucker Sno-Cat) using a four-wheel drive was also developed. Independent tracks on each wheel allowed the vehicle to be steered by the front tracks" (Gray, p. 527).

1951 (January 15) "The Bradley snow packer-grader now in use at Winter Park, Colo. for shaving off bumps. Designed by Steve Bradley, manager of Winter Park, the XPG-1 is merely a modification of principles employed in ordinary road graders adapted to the special problems of ski slope maintenance" (National Newspaper of Skiing, January 15, 1951).

1952 Bombardier granted a patent for a circular rubber vulcanizer. "...Permitted the production of seamless belts which solved the problems of tension and breakage associated with the bolting of caterpillar tracks"(Lacasse, p. 119).

1952 Bradley Packer used at Winter Park, CO. Invented by Steve Bradley, "the first hill-grader that emerged successfully was equipped with huge rollers and looked like a mini-ferris wheel" (SAM, Spring, 1970, p. 43).

1952-53 "For the winter season of 1952-53, Pabst invested in three new Sno-Cats with packers, wide rollers with slats that simulated side-stepping skis" (Pabst, p. 36).

1953 Bombardier granted a patent on a resilient cogwheel. "The new cogwheel was supple and malleable, and it could resist most kinds of shocks. ...For many years the breakage of sprockets had been the bane of his off-road vehicles. Made of iron, steel, aluminum, and a nickel-steel alloy, these wheels were relatively brittle. They could not be positioned at the front of the vehicle....It was made of alternating layers of cotton fibre and rubber, molded and pressed parallel to the surface. The new wheel was practically unbreakable" (Lacasse, p. 119).

1953 (Spring) "The Valcourt plant began the assembly-line production of the Muskeg...The Muskegs were used mainly by companies involved in oil exploration. They were later taken up by prospectors working for mining companies in northern Canada. Their popularity spread to companies involved in the construction and maintenance of power and telephone lines, roads, railways, telecommunications towers, ski resorts, cable cars, and radar lines" (Lacasse, p. 126).

1953 "The most significant contribution to oversnow travel in the twentieth century has been the development of a wide range of mechanized oversnow vehicles which can operate away from roads or trails. In Canada, the development of these machines can be largely attributed to the effort of two persons: Joseph Armand Bombardier of Valcourt, Quebec, and W. Bruce Nodwell of Calgary, Alberta...While Bombardier was perfecting his lightweight snowmobile, Bruce Nodwell was directing his efforts to producing large, heavy duty transportation equipment for the oil industry. In 1953 he adapted a Ford tractor to oversnow use and in 1954 he developed a unit that could handle 4500 kg of seismic drilling equipment in heavy muskeg" (Gray, p. 522).

1953 Edson Hill Manor in Stowe bought a Tucker Sno-cat from Stowe (Sandra Heath).

1954 (January 15) "'L'Auto-Neige Bombardier" carries a load of skiers from Sunshine Village near Banff, Alberta up to Brewster's Rock. From this point, the skiers have a 1000-foot vertical drop back to the starting spot" (National Newspaper of Skiing, January 15, 1954).

1954-55 In Minnesota the brothers Edgar and Allen Hetteen, and their partner David Johnson built the first Polaris Sno Traveler, inspired by some of Eliason's ideas. A small number of this vehicle, also known as the Autoboggan, was sold for utility purposes" (Bombardier Foundation, p. 57).

1956 "Utah Scientific Foundation produced its largest oversnow vehicle called the Trackmaster, which

was essentially an enlarged Frandee but with individual transmissions for each track. Turning was accomplished by speeding up one transmission and slowing the other. The tracks were steel-cleated, endless belts driven by rubber-coated sprockets" (Gray, p. 531).

1957 "Not since 1914 had anyone attempted this immense trek, until Sir Vivian Fuchs' crossing of Antarctica in 1957...The transpolar party had at their disposal eleven vehicles of which the four (Tucker) Sno-Cats were the most photogenic...The Sno-Cat is made in the USA by the Tucker Corporation and has a 200 hp Chrysler V-8 engine. The two tracks are driven by propeller shafts and each pontoon is free to turn about its axle and is sprung with leaf springs connected to the steering platform. A conventional steering wheel in the cab actuates the hydraulic system which turns the pontoon tracks. A special point is that the front pontoons point to the right when turning right but the pair at the rear turn to the left. This proved to give far better traction than any of the two-tracked machines, especially on soft snow" (Lorch, p. 82).

1957-58 Bombardier builds his first prototype Ski-Doo. "Armand's new project also took advantage of work done by his son Germaine in Kingsbury. Germaine had patented an improved caterpillar track for use on a Bombardier vehicle designed for grooming ski trails. The seamless track provided the traction Armand needed for the new vehicle he had in mind...Armand designed three new models in 1958 before deciding on the form of vehicle he wanted: a kind of motorcycle on track and ski...(Lacasse, pp 144-45).

Late 1950s "The Kristi oversnow vehicles were manufactured using airplane-type construction with tubular framework and were equipped with a cab encased by a thin metal skin. A Volkswagen engine powered the metal-cleated, double-belt track through a standard transmission and differential. A unique feature was a hydraulically-operated cab leveller that allowed the cab to remain level while negotiating hillsides. The first models of this machine had the motor in the rear but later versions had the power unit in front" (Gray, p. 532).

Kristi address: Broomfield, CO (SAM Fall 1962, p. 20).

Unclear date " "They (chairlifts) were the wave of the future," Bradley said. "I could think of no decent way to get these graders back up the hill without the T-bar. We didn't have powerful snowmobiles like we have now to haul the Packers up."...He refined the Packer, added a hydraulic lift and mounted it on a Christy (sic) Cat, making it the first machine-powered grader. When officials from Thiokol learned about the grader, they asked Bradley to license them to make one for a larger cat. He spent some time with their engineers and came up with a design for the mogul planer" (Abney, p. 69)

Late 1950s Stowe had a fleet of Tuckers (Brian Linder phone interview 12-12-01).

1959 (March) ...Local residents heard an unusual racket. Armand and his men were roaming the countryside on their new light vehicle. They called it a Ski-Dog; it was basically a toy for grown-ups...The name Ski-Dog was quickly abandoned in favor of Ski-Doo. The name change happened almost by accident. A typographical error slipped into the brochures printed for a Bombardier convention, and 'Dog' became 'Doo'. Armand thought Ski-Doo sounded much better than Ski-Dog in any language and it was easier to remember" (Lacasse, p. 147-48).

1960 "Miniature snowmobile" patent granted to Bombardier in Canada. "They protected the suspension system for the single track, the compact and rational layout of the engine and transmission, the whole suspension system, the dismantling system, and the ski steering system" (Lacasse, p. 146)

Early 1960s "The Utah Scientific Foundation turned over production of its machines in the early 1960s to the Thiokol Chemical Corporation, which modified the existing models and developed new ones. Many of these are modifications of the earlier Frandee and Trackmaster models. The most significant change in the original models is in the steering mechanism, which is now a planetary controlled differential system allowing braking and power transfer to individual tracks" (Gray, p. 539).

1961 Eastern Distributors, Inc, Concord, NH brochure offers Sno-Rollers (slat rollers), Sno-Carpet (magic carpet-like), and Sno-Vac, Sno-Mo and Sno-Trailers as well as Tuckers. (Museum collection).

1961 Charlie Lord's tips for trail maintenance: "1. Roll your slopes after fresh snow falls. 2. During icy periods, break up hard surfaces with scratchers. 3. Eliminate booby traps such as deep ruts, over-large moguls or wind-drifts by machine grading or hand shoveling." (Ski Business, Spring 1961, p. 73)

1961 Bombardier Snow Packer, with wide tracks designed specifically for ski resort grooming; only two units produced. Mount Orford in the Eastern Townships used one of the machines (Bombardier Museum letter, 4-23-2001).

1961 (Fall) Nelson Bennett article on mogul field grooming in west: shovel crew or mechanical maintenance device. Ski packing, shoveling off mogul tops, ski packing. Leave trail closed to set over night. (Ski Business, Fall 1961, p. 77)

1962 (Fall) Tucker Sno-Cat advertisement showing slatted roller and Sno-Mo attachment (an implement designed after agricultural flail mowers, for snow, per Bob Smith) in first issue of Ski Area Management (SAM, Fall, 1962, p. 2).

1962 (Fall) "Every area manager is familiar with the near-human frailties of these machines, and it is a lucky one who hasn't nursed one of them through repeated bouts of temperament in the course of a season". Article on fragility of machines and the personality traits desired in tractor drivers (Ski Business, Fall 1962, p. 26).

1963-mid 1980s: Bob Smith of Ludlow VT involved as Tucker distributor for Ed-Gil Distributors. Eastern Distributors had gone bankrupt. He sold one of his first machines to Fred Pabst, Jr. Stowe and Bromley were into grooming first in the state, Okemo was not. They had a Bombardier Muskeg that couldn't groom uphill. Smith build and sold hundreds of open slat and culvert rollers . He estimated he sold 50 new and 20 used Tuckers in the 1960s. He devised the amidships straight blade for the Tucker, based on road graders, which allowed snow to be windrowed back to the center of the trail. The blade cost \$2500 to add to a Tucker; he sold about 50 over the years. The floorboards were removed from the passenger side so the operator could observe. Later Tucker tried Valley Engineering front blades, was never that effective because the Tucker was long and light, and had a large turning radius when blading. Tucker as a company didn't know or care about the ski business, they were selling to the government. He also built the Tucker Mogul-planer and shipped them to Oregon. Tuckers advantage--light and good climbing ability, especially in soft snow. (Smith)

1965 (Fall) Thiokol advertisement for Snow Spryte, shown towing slat roller at Cranmore. Price \$6750 (SAM, Fall 1965, p. 19).(Museum lacks issue between Fall 1962 and Fall 1965).

"Thiokol adds versatility: The Thiokol Spryte 1200 series over-the-snow vehicles can be equipped with a new hydraulic snow roller and snow plow to increase the machine's utility as a slope grooming system. The blade and rollers can be lifted from inside the cab. The rollers pack a swath 14 feet wide (SAM, Fall

1965, p. 44).

1965 "In 1965 a vehicle called the "Spider" was developed (by Nodwell) for use in deep snow and was found to be particularly useful in grooming ski slopes....During 1965 Nodwell and five other track-vehicle associates left Robin-Nodwell Manufacturing Limited, an outgrowth of the original company, and together with Jack Nodwell formed Foremost Development Limited " (Gray, p. 522). "...His companies have evolved a full range of tracked or wheeled vehicles in the medium-to-heavy payload range which are now marketed under the name of Foremost International Industries, Ltd, located in Calgary, Alberta" (Gray, p. 534).

1967 (Winter) John Deere advertising in SAM for JD350 blading in resort applications. (Issues between Fall 1965 and Winter 1967 missing)(SAM, Winter 1967, p. 19).

1967 (Fall) "Reynolds and Son, Barre, VT offers an improved model of the Catamount slope conditioner. The unit can be adjusted in two to three minutes by a hand-crank mechanism to control penetration from scratching action to full chopping and digging. The pads contain a total of 150 chisel-type teeth, hardened to retain sharpness. The unit's 900 pounds are evenly distributed for maximum efficiency" (SAM, Fall 1967, p. 63).

1967 (fall) Snow Master and Snow Trac Oversnow vehicles advertised in SAM. "These popular Swedish-made vehicles, manufactured by one of the world's most experienced producers...powered by air-cooled Volkswagon engines...both units available with 2- or 7-person cabs" (SAM Fall 1967, p. 50).

6 Snow Masters were sold on the east coast. He has two in his collection. (Brian Lindner phone interview 12-12-01).

1967 (October) Article discusses "buddy" system of bulldozing steep trails developed by Ray Parker, working on Sno-Engineering jobs; "one bulldozer anchoring the other and hauling it back on a winch. Working in tandem this way, he can safely cut trails up to a 70 percent gradient" (Skiing Area News, October 1967).

1968 (January) Article in Skiing Area News on snow maintenance at Bellarye, NY. Includes descriptions of different implements and the conditions they are used for (Ski Area News, January 1968, p. 33).

1968 (Winter) Ad for Prinoth P-15 in SAM. Distributed by Ted Wheeler, Wynnewood PA. "Europe's most progressive snow-grooming vehicle" (SAM Winter 1968, p. 13).

Thiokol advertises new hydraulic mogul cutter in SAM, shown with a Spryte (SAM, Winter 1968, p. 17).

Catamount Slope Conditioner ad (SAM, Winter 1968, p. 24).

1968 (Spring) Tucker advertises Tucker Sno-Cat with amidships Mogul-Masher grader blade (SAM, Spring 1968, p. 2).

1968 (fall) Hard-Pak Pulverizer advertised in SAM; a towed tiller with enclosed cab and engine, looks as if shown towed by a bulldozer (SAM Fall 1968, p. 55).

Nodwell Snopacer advertised in SAM. Flextrack-Nodwell, shown pulling a mogul planner with roller and chain link drag (SAM, Fall 1968, p. 58).

Article in Skiing Area News on snow grooming at Mammoth, CA; discusses equipment modification, trucking snow from parking lot to hill in Thiokols with dump bodies, and salting mushy spring snow (Skiing Area News, Fall 1968, p. 36).

1968 Powder Maker developed by Otto Wallingford of Lost Valley, Auburn, ME. "In the mid-1960s, Otto began to focus on grooming. He was determined to come up with a method of turning frozen, man-made snow into packed powder. He had tried various farm implements, including a tine harrow and a tiller, but the results were unsatisfactory. The snowcats of that time had no blades and no hydraulics to run them, so Otto got together with Don Waterman at the Oliver Stores and rigged up a hydraulic pump on a Thiokol, mounting a straight blade to bulldoze moguls and piles of man-made snow. That's when he devised the big breakthrough. Otto and Don built an eight-foot roller out of spandex steel. This steel, with its diamond-shaped openings, was expected to grind the snow into powder. The results were so-so until Otto hit on the idea of an oblique angle. As he told me, "Halfway up Bobcat the whole thing fell apart, but in that short distance we could see it was doing the job". A more solid model was built with two rollers and used for the rest of Lost Valley's season. The inventor took it to Sugarloaf in the spring and showed it to mountain manager Hazen McMullen, who wouldn't give it back. In McMullen's words, "It was the only piece of equipment that worked in the spring". That summer, using his own funds, Otto built 25 "Powdermakers" on speculation and sold them all before Christmas. In 1969, he and Don Waterman started Valley Engineering to manufacture and market the product" (Dave Irons column, probably about January, 2000 at time of Wallingford's death).

"The company that followed, Valley Engineering, went on to hold patents in seven countries, adding the now universally-used "U" blade and Power Tiller to its inventory of grooming equipment" (Irons).

1968 ""As Valley Engineering led the developments in snow grooming attachments, the Karl Kassbohrer Fahrzeugwerke GmbH of Ulm, West Germany was establishing itself as a world leader in the manufacture of snow grooming tractors," Gardner said. Like Wallingford, Karl Kassbohrer, Sr first conceived the idea of designing and building a truly efficient grooming tractor in the 60s after observing the clumsy conversions of existing models to do-it-yourself models and realizing the need for efficient equipment. A small team of designers began drafting the outlines of Kassbohrer's concept in 1968. Twelve months later a totally new ski slope maintenance vehicle was born. The machine was christened "Pisten", meaning ski slope, and "Bully", meaning a tough guy who will tackle any job with determination" (Michaud).

1969 (Spring) Thiokol advertises IMP 1400 Series, X-1900, X-2100," a new concept in slope grooming with 4 and 6 ft wide tracks" (SAM Spring 1969, p. 5).

1969 (Summer) Article on snow grooming at Winter Park shows mogul-grooming demo using Thiokols with front blades, culvert rollers (Skiing Area News, summer 1969, p. 36).

1969 (Fall) Thiokol advertises Packmaster wide track. "...Last year we sold more units than all other makes combined...Tracks a full 5 feet wide. Just over a half pound pre-square-inch ground pressure. A reliable and powerful Ford engine...we call it the new "super wide-track Packmaster". Also shown; grooming attachment, hydraulic chain-link implement: "grooming tool that can be used as a back blade, snow compactor bar, or scarefire" (SAM, Fall 1969, inside front cover).

"A one-passenger vehicle specifically designed for ski areas has been introduced by Logan Division, Thiokol Chemical Corp, Logan, Utah. Named the Packmaster, the vehicle has tracks that are five feet

wide, giving it a ground pressure of barely over one-half pound per square inch. Its engine has 300 cubic inches, larger than the 200 cubic inches of the Thiokol Spryte. The price of the Packmaster is about the same as the Spryte, a spokesman said.

Thiokol also has introduced a multi-purpose tool for slope grooming. The company calls it a compactor bar, but it can also be used as a back blade and a scarifier. ...It comes with a mesh drag and is designed for use with a hydraulic lift frame assembly. The price of the tool is \$695. Price of the hydraulic lift, which can be used with other pieces of snow grooming equipment, is \$895 (Skiing Area News, Fall 1969, p. 53).

circa 1970 Thiokol Packmaster was driver-friendly, had better hydraulics than competitors, and took over the ski area market in the east, which Tucker had previously (Ericksen).

1970 Bombardier introduces Skidozer, or SV-250 (Bombardier Museum letter 4-23-01).

1970 (winter) Valley Engineering, Auburn ME advertisement in SAM. Powder Maker, Snow Plane, and Hydra Saddle, available from local Thiokol dealer. (SAM, Winter 1970, p. 41).

Article on the Hard Pak Pulverizer, invented at Brodie Mountain by Jim Kelly. Powered by a 100 hp diesel motor, the idea came from debarking machines in the logging industry. Rotor head resembles a modern power tiller with tines mounted parallel to axis of tiller (Skiing Area News, Winter 1970, p. 26).

Kelly sold about 35 or 40 Hard Pak Pulverizers, per Nils Erickson (telephone interview 5-17-2001)

1970 (spring) Bombardier advertises SV-250 in SAM (SAM, Spring 1970, p. 22).

1970 (fall) Valley Engineering advertises Quik-Mount to change front implements; shows Spryte with articulating blade. (SAM, Fall 1970, p. 4).

1971 (spring) "Bradley Basher is an early slope grooming tool still in use at Winter Park" (Skiing Area News, Spring 1971, p. 23).

1972 "Bombardier wins four firsts at NSAA meet: ...at the NSAA Mid-Winter Meeting at Waterville Valley, NH...Tucker won first for mogul planing and Dressing with the Tucker with Mogul Planer; the Thiokol 2100 V-8 with Mogul Planer took second and the Thiokol 2100 6 Blade and Dresser Bar took third...Thiokol won its two first places in the hill climbing contest, followed by the Bombardier 501 and Tucker V-8, and in hard snow preparation with the Thiokol 2100 V-8 12-foot powdermaker followed by the Tucker V-8 Catamount and the Bombardier 501 12-foot powdermaker...Bombardier's Skidozer 501 was named the best overall vehicle at the show"(SAM, Spring 1972, p. 22).

1972 (Spring) Kassbohrer 'Pisten-Bully' advertised in SAM. "Attachments available for easy mounting: VE Front Quick Hitch, U Blades, Front Compactor, Leveling bar, Rear Lift, Rear Compactor, Rear Leveling Bar, Powder Maker, Trail Conditioner" (SAM, Spring 1972, p. 21).

1973 (Winter) West Mountain Sales, Glens Falls, NY advertises Sno-Grader in SAM (SAM Winter 1973, p. 17).

Thiokol 2500 Hydromaster introduced (SAM, Winter 1973, pp. 42-43, with other vehicle descriptions).

1973 (Spring) Tucker announces new rubber-tracked model in SAM; "The Tucker 1500 is a new cat with rubber tracks and steel-track growers...the 1500's rubber tracks are strong and durable with many ski

areas reporting over 5000 miles of operation during the last season" (SAM Spring 1973).

Sierra Engineering advertises "Save that old Tucker Snow Cat with rubber belt tracks...price \$5483 plus freight" (SAM, Spring 1973, p. 91). "the belt tracks will eliminate the costly maintenance of the steel pontoon" (SAM, Spring 1973, p. 97).

First SAM ad with Valley Engineering address Gray ME (SAM Spring 1973, p. 46).

1975 (Fall) West Mountain advertises Sno-Tiller, "aggressive high-speed hardpack breaker...conditions thick, uniform layer of chips ready for additional surface powdering...already in use at Stratton, Hunter, Sugarloaf, West Mountain, Pico and others " (SAM, Fall 1975, p. 27).

1976 (Spring) Thiokol introduces 3700 Hydromaster (SAM Spring 1976, back cover).

1980 "In January of 1980 Valley Engineering was purchased by Kassbohrer Company, becoming a division of Kassbohrer of North America, Inc" (Michaud).

1980 "Valley Engineering became a wholly owned subsidiary of Karl Kassbohrer...of Ulm, West Germany, manufacturers of the "Pisten Bully" line of over snow vehicles. Its facilities, now located in Gray, Maine, were enlarged as Valley Engineering now began producing the Pisten Bully models PB 170 and 200 D" (www.katvpb.com).

1989 LMC (Logan Manufacturing Co, formerly Thiokol) shows groomer on winch in ad (SAM, September 1989, back cover) (missing long run of SAM between 1976-1989).

1991 (January) Kassbohrer shows winchcat (SAM, January 1991, front inside cover).

LMC advertises Flex Tiller (SAM January 1991, back cover).

1992 Prinoth shows T4 Extreme Winch (SAM, July 1992, p. 54).

2001 Kassbohrer advertises water injection beam attachment to make treated areas more resistant to mechanical strain caused by carving skis, snowboards, and the effects of weather. (www.katvpb.com)

References

Abney, Gail, "Bradley Packer 35 Years Later", *Ski Area Management*, March 1989, pp. 68-69.

J.-Armand Bombardier Foundation, *Musee J.-Armand Bombardier*, Valcourt, Quebec, 1991.

Ericksen, Nils, telephone interview 4-13-2001.

Gray, D.M. and Male, D.H., eds., *Handbook of Snow: Principles, Processes, Management & Use*, Willowdale Ont, Permagon Press, 1981.

Gregg, Stephen T., personal interview, 10-4-2001

Irons, Dave, "Wallingford Smoothed Skiers' Way", *Boston Globe* Ski Section, January 6, 2000.

Lacasse, Roger, *Joseph-Armand Bombardier: An Inventor's Dream Come True*, Libre Expression, 1988.

Lorch, Walter, *Snow Travel and Transport: The Story of Snowmobility in Pictures*, London, Watmoughs Limited, 1977.

Michaud, Ellie, "Maine Snow Groomer an International Success", date and publication unknown, sent by Wendall Nason.

Pabst, Philip L., "Fred A. Pabst, Jr: A Pioneer of the Skiing Industry", undergraduate History paper, April 16, 1989, New England Ski Museum collection.

Smith, Bob, telephone interview, 5-25-2001.