Part One

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Joseph-Armand Starts a Company: The 1940s and 1950s

Humble Beginnings

Until 2003, the corporate logo of Bombardier was a gear—a sprocket—a rather simple-looking wheel with several teeth around the circumference. The teeth are broad in width and flattened at the top, suggesting durability. Across the center of the sprocket is emblazoned the company's name.

There is much significance to this logo, for the development of the sprocket was a crucial step forward in Joseph-Armand Bombardier's quest to develop a vehicle that could travel reliably over snow. When the rubber-encased sprocket was interlocked with a rubber-belted traction device, it provided the necessary shock absorption and propulsion to power a vehicle through virtually all wintry conditions.

He used this sprocket, a cogged gear wheel made of wood and covered in rubber, to drive the track. The track itself was made of two rubber treads connected by steel crossbars. Joseph-Armand Bombardier modified an existing vehicle by placing

the motor at the back and reducing the weight of the body. He also invented a revolutionary new traction system: the sprocket wheel system. The sprocket is extremely effective for delivering power to the track. This new system made snow removal easier, thanks to the openings between the steel crossbars and the rubber treads. Using rubber considerably reduced wear on components.

This major innovation was the culmination of nearly 10 years of experimentation, from 1926 to 1935, in the Garage Bombardier in Valcourt. Joseph-Armand threw his energy into mechanical research during the winter months, when there were fewer agricultural equipment and motor vehicles to repair. Joseph-Armand won his first patent in June of 1937, but it was in 1936 that he developed the B7 snowmobile—"B" for Bombardier and "7" because it could hold seven passengers. Many B7 customers were country doctors who wanted a way to reach their patients more quickly on the snowy roads of Quebec.

Most important of all, the sprocket and belted track breakthrough led to the decision in early 1937 to close Garage Bombardier and focus on the full-time production of snowmobiles under the company name of L'Auto-Neige Bombardier (Bombardier Snowmobiles).

Such were the humble origins of the transportation giant now known as Bombardier Inc., which became a world leader in land and air transportation. The sprocket, which was used on the Bombardier logo until 2003, was hence highly meaningful as the device that launched the company.

The Bombardier Snowmobile

The first vehicle adapted to travel on snow was designed in 1904.

The difficulty of motorized travel over snow is highlighted by the fact that man-made machines could fly through the

air before they could travel over snow. It was easier to lift a machine into the air than to send it over snowy terrain. The Wright Brothers' first plane flew in 1903, while the first vehicle equipped for snow travel did not emerge until 1904.

In that year, Frenchman Adolphe Kégresse, technical director in the imperial garage of Czar Nicholas II of Russia, converted an automobile to a snowmobile by installing a track drive around twinned rear wheels and a set of skis at the front for steering. Returning to France after the Bolshevik Revolution of 1917, Kégresse sold the patent rights to his inventions to automobile pioneer André-Gustave Citroën. Further development led to the Citroën Torpedo, a vehicle aimed mainly at travel over swamp and sand. It was tested in the Sahara desert, and as part of a publicity campaign in 1931, two expeditions of the Citroën Torpedos journeyed to China.

In 1913, Virgil White, a Ford dealer in New Hampshire, devised a track and ski unit for the Model T Ford and later for the Model A. These units enabled the vehicles to travel over unplowed roads in the winter. During the 1920s, he built and sold 25,000 of the conversion devices and patented the term "snowmobile."

In 1922, Joseph-Armand, then a lad of 15 who was fascinated by all things mechanical, designed his first snowmobile: a four-passenger sleigh frame supporting a rear-mounted Model T engine with a spinning wooden propeller sticking out the back. He and his brother drove this dangerous and deafening contraption for a kilometer (just over half a mile) through Valcourt before their alarmed father ordered them to stop.

In 1924, Carl J. E. Eliason from Wisconsin invented a device he called the motorized toboggan, which consisted of a wooden toboggan fitted with two skis steered by ropes and pushed along by a steel-cleated track powered by a 2.5 horsepower Johnson outboard motor. Eliason patented his machine,

and it was manufactured until 1960 by his company and, later, the FWD Corporation in Canada.

Another pioneering effort at fashioning a functioning snowmobile was made by Adalbert Landry and Antoine Moriset of Mont-Joli in the Gaspé region of Quebec. Their effort was another attempt to convert an automobile. They put skis on the front for steering, and a caterpillar belt over the double rear wheels for propulsion. In 1924, Landry traveled the nearly 600 kilometers (375 miles) from Mont-Joli to Montreal in his snowmobile to an automobile show, arousing considerable excitement along the way.

While Eliason and the two Quebecers were demonstrating their inventions in 1924, Joseph-Armand had started an apprenticeship as a mechanic in Montreal after convincing his parents that he was more suited for that line of work than the priesthood toward which he had been in training. During the day, he soaked up the tricks of the trade, while in the evening, he took correspondence courses in electrical engineering and mechanics. He also began to teach himself English because most of the science and technology journals were available only in that language.

This was the extent of Joseph-Armand's formal training. There were no courses in engineering or science at the college or university level to provide him with the knowledge of electricity, construction, metal casting, vulcanizing of rubber, and other subjects necessary for developing his inventions in years ahead. That knowledge was mostly self-taught, acquired through reading journals and the experience of several years as a hands-on mechanic.

He was indeed driven by an insatiable thirst to learn everything about mechanical devices. Traveling companions on his occasional vacation trips outside of Valcourt remembered Joseph-Armand slamming on the brakes of his automobile and

dashing across a muddy field to inspect some piece of farm machinery that had caught his eye. He was always curious about things mechanical. When he bought an airplane later in life, he took its engine apart to see how it worked.

Victor Plante, a friend who managed an automobile repair service in town, received several visits from Joseph-Armand over the years that appeared to be more in the nature of research expeditions. Without even saying hello, Joseph-Armand would start to poke around Plante's garage, stopping only to examine a new tool or mechanical part. "He was studying the piece so intensely with his eyes and his hands that he seemed to be talking to the metal," Plante recalled. "When he put it down, I had the impression he knew everything about it, its characteristics, and its use. Sometimes, with his mind totally absorbed in what he had seen, he would leave, completely forgetting the purpose of his visit and without even saying good bye."[1] These visits to Plante's garage must have had an air of scientific expedition: they gave him an opportunity to expand his knowledge and further advance his research.

Dr. André Lefebvre got an interesting reception when he went to see Joseph-Armand in 1939 to inquire about his snowmobiles. Before the doctor even had a chance to explain the nature of his visit, Joseph-Armand had his head under the hood of the doctor's car, a 1929 Ford. "He was examining the motor," the doctor recounted, "an eight-cylinder, 85-horsepower job, of the same type he was using in his B7s. He wanted to know how the motor had behaved all these years, the repairs done to it, and how it sounded after running for 10 years. This seemed much more interesting than saying hello or finding out what I was there for."[2]

In any event, by the time Joseph-Armand returned to Valcourt at the age of 19 to set up his own garage, the earlier attempts of previous innovators to design snow-going vehicles

had met with limited success. The Eliason toboggans were functional, but they were more of a curiosity than a vehicle for use in everyday transportation. Kégresse and Landry half-tracks were clever inventions, but they were flawed: snow and ice accumulated in their massive tracks, causing a serious loss of traction; the tracks also tended to break or slip off the gears, resulting in a breakdown. Moreover, these vehicles simply had a hard time moving through deep snow.

In 1927, inspired by the technological developments taking place with tracked vehicles, Joseph-Armand stepped up his attempts to develop a vehicle that could travel on snow. He sold his prototype that same year, but, unsatisfied, he continued to pursue his research. In 1929, he adapted his tracking system to a Model T Ford, but the machine wasn't what he was aiming for. The inventor wasn't yet able to solve the problems he encountered of buoyancy, weight, and the efficiency of the traction system. He continued to experiment, increasing his efforts, until finally he invented the sprocket wheel system.

Still, Joseph-Armand was not satisfied, and he started work on a second set of prototypes based on the propeller concept from his adolescence. He gave up because of the inability to go in reverse, problems with the engine overheating, and the danger of the spinning propeller.

By the mid-1930s, Joseph-Armand's attempts had not produced a satisfactory solution, but they had nevertheless yielded many insights into what the successful design would be. For one, the engine would have to be rear mounted to better distribute the weight of the vehicle so that the front runners would not be pushed down too deep in the snow. Second, breakage and slippage of the belt (as well as strain on the engine and differential) could be reduced by using rubber rather than metal belts on the rear wheels.

By 1935, Joseph-Armand was able to combine these ideas with his sprocket device to produce a machine that finally resolved to his satisfaction the problem of traveling over snow. The prototype used a Ford chassis and other body parts, with skis in the front for steering. The engine was located in the rear with the hood facing backwards. Joseph-Armand once nearly got a parking ticket for seemingly parking the wrong way. The propulsion system was based on two parallel rubber belts coupled together with carbon steel cross-links for strength. The belt was fitted around a rear unit on either side consisting of two Ford wheels and Joseph-Armand's sprocket.

The following year, a new version called the B7 was created. A major change was the outward appearance. A lightweight cabin made of plywood, similar in shape to the Volkswagen Beetle profile, now sat on the chassis. A new drivetrain and rear suspension were developed. It included parallel bars that supported the wheels and was linked to the chassis by means of a leaf spring. Priced just above $1,000, about the same price as low-end automobiles of the time, enough of these B7 models were sold in the first year to encourage Bombardier to go into production mode.

From 12 vehicles in 1937, annual output increased to 25 in 1938 and to 50 in 1939. Rising above the ravages of the Great Depression in the 1930s, a viable business was in the making as the popularity of the B7 spread outward from the early clientele of doctors to include taxi drivers, bus operators, innkeepers, funeral directors, utility company workers, milkmen, missionaries, and traveling salesmen.

Every year, the B7 model would be improved in some way. The sprocket was made of stronger metal alloys and sheathed in a more durable rubber casing. To provide a smoother ride, the suspension system was further refined. By 1939, it consisted of soldered axles and springs in protective metal jackets,

which prevented ice accumulation and allowed the front skis to better absorb the shocks of hitting hard objects.

A remarkable transformation was now under way. His automobile garage was turning into a manufacturing operation, and Joseph-Armand was evolving from a mechanic-inventor into an industrialist. A preliminary task for him in this regard was to put together a group of workers and train them in manufacturing. In the first tier of employees were members of his extended family: four brothers and three cousins.

Another important function was marketing—getting the word out on the new mode of transportation. Before delegating this function to his brother Alphonse, Joseph-Armand handled it himself. He hired garage mechanics as sales agents, and took his B7 on trips around the province to demonstrate its abilities. A favorite tactic was to visit local newspapers to get coverage. It nearly always worked. The vehicles were such attention grabbers that the editor usually assigned a reporter immediately. A giant publicity coup was scored when Joseph-Armand backed his B7 all the way up the lengthy toboggan slide near Le Château Frontenac in Quebec City just to prove it could go anywhere. Joseph-Armand's fast-growing enterprise was an all-consuming passion. He was totally absorbed, working 16 to 18 hours a day for six days of the week. Even on Sundays, the day of rest for a devout Roman Catholic such as Joseph-Armand, he would sometimes put in a few hours of work after church. There never seemed to be enough time. A few precious seconds were saved each day by bounding up stairways three or four steps at a time. This constant state of agitation often left him sleepless at night, but rather than just laying there, he would slip down to the shop and get some more work done.

He was the kind of businessman who had to be involved in every aspect of his company. Juggling the jobs of president, chief engineer, and head of production over the next 22 years,

Joseph-Armand's frantic pace did not always result in the most enlightened human relations techniques when dealing with employees. He could be brusque with those who needed to have things explained at length or who did not accomplish tasks as quickly or as proficiently as he thought they should. He rarely offered praise or encouragement and preferred to impose his will to get a job done rather than engage in persuasion. Invariably, relationships with those around him were strained; employees usually felt a degree of anxiety in his presence.

Joseph-Armand was such a perfectionist that it was hard for him to stand by and watch someone else putting together one of his machines. He would at times nudge workers aside from their machinery to show them how to produce better results. He was so concerned about getting things done the right way that he had an open-door policy whereby employees were free to come visit him anytime if they had a work-related problem. The result was a steady stream of visitors from the shop floor. Instead of thinking things through for themselves (and risk the disapproval of their boss), employees found it easier to go see Joseph-Armand, even if their problems were sometimes minor.

Joseph-Armand might be in the midst of discussing a legal matter with his lawyer or a tax issue with his accountant, but he would usually drop everything to accompany the employee back to the shop floor to provide a solution. The visitor would be left alone in his office until Joseph-Armand would reappear, often with grease up to his elbows, to resume the conversation.

His accountant, Jacques Bélanger, recalled one meeting with Joseph-Armand when he suddenly stopped the conversation and strode over to a dismantled engine on a table. Joseph-Armand seemed to have a solution to a mechanical problem he had been mulling over, and wanted to deal with it then and there. He told Bélanger that he was going to take a piece for drilling. On the shop floor, he approached one of his

employees and told him to drill two holes in different spots. As the shop worker slowly turned the piece over in his hand, Joseph-Armand snatched it back and went over to the drill and did it himself. Back in his office a few minutes later, he fit the piece into the engine, turned the ignition, and smiled as the engine roared to life. He then shut it down and returned to his chair to resume his discussion with Bélanger, amid the gas fumes.

Yet Joseph-Armand's impatient and looking-over-the-shoulder management style worked. Despite a number of obstacles, his business flourished and produced affluence for him and his associates. A main ingredient was his ability to pick people who would be able to work with him; the fact that employees in key positions had family ties likely also helped.

Moreover, although they and other employees may have been on edge, they respected Joseph-Armand because of his brilliance in mechanical matters. He had an inventive genius that supplied the firm with many successful products. But they also respected his drive and his devotion to work and excellence; he did not demand anything more of his workers than he demanded of himself. And Joseph-Armand was aware of his effect on his employees, earning a degree of forgiveness from them by apologizing periodically for the nervous tension and fatigue that led to his abrupt style.

Joseph-Armand was not by nature as austere a person as the workplace would suggest. In moments of leisure, he displayed a gentle and kind disposition. Then, he was also a more relaxed individual, fond of playing practical jokes on close acquaintances. For example, during a hunting trip—one of his few regular leisure activities—he came across a buddy who had fallen asleep on his watch for moose. Joseph-Armand quietly crept up and tied a moose tail to the end of his rifle. Upon awakening, his friend jumped to his feet, startled by the dangling tail. A roar

of laughter burst forth from Joseph-Armand and his assembled comrades.

Joseph-Armand's *modus operandi* was to some extent a reflection of the nature of his business. Production runs tended to be small and nonstandard. The many innovative products coming out of his fertile imagination also had to go down a learning curve before their technology was stabilized enough for production. It was not an easy environment in which to delegate and decentralize. Joseph-Armand's business manner was also to some extent a result of the many crises thrown up by the constant flux of the business environment. Indeed, these external events at times threatened the very survival of the company, no doubt delivering anguish and stress to the founder. In fact, the pressures produced bouts of insomnia and left Joseph-Armand in a continuous work mode.

Inventions and Innovations

The course of a commercial enterprise is fashioned by the complex interaction of interior and exterior contingencies. There are variables within the company that are under the control of entrepreneurs, but others in the external world are beyond their control. As such, each business is an uncertain ship cast upon the waters, headed for an unknown destination. The bow might be pointed toward some specific point, but unforeseen currents and storms may push the ship onto hidden reefs and rocky shoals.

Not surprisingly, the life of the entrepreneur is usually one of peaks and valleys. There is the potential for wealth and esteem, but there is also the chance for interminable periods of despair, culminating sometimes in collapse and resignation. Whether the down times turn out to be permanent depends on the interaction of a multitude of variables within a company and outside it. Entrepreneurs may improve their probabilities by gaining more

competence over the internal variables, but ultimately, every commercial venture has an element of rolling the dice to it.

The case of Joseph-Armand and his fledgling business provides one of the better illustrations of this dynamic, except Joseph-Armand somehow seemed destined to overcome anything in his path. His determination and ingenuity made him seem like a force of nature. None of the external variables proved capable of holding him back for long; there were no hurdles or setbacks that could extinguish his indomitable spirit.

The first setback came early on, just when everything was looking great. As the 1930s came to a close, demand for the B7 was taking off. While some Quebec streets in and around urban centers were cleared of snow during the winter by this time, these were the exception. Many main and secondary roads in the snowbelt region were left unplowed, creating a market for dependable snowmobiles. And with signs that the North American economy was finally recovering from the greatest depression of the twentieth century, the future looked bright for L'Auto-Neige Bombardier.

Demand was, in fact, outstripping the capacity of the Valcourt plant and annexes, leading to a decision to build a new, modern plant with an annual production capacity of 200 snowmobiles. As construction on the building went ahead, the development of the B12—a 12-passenger version of the B7—moved toward completion. By January of 1941, the new factory was complete, and Joseph-Armand was on the verge of becoming a wealthy man.

However, just two weeks after the inauguration of the new facilities, the Canadian federal government issued wartime rationing regulations to redirect national production away from civilian needs toward military requirements. In this environment, Bombardier customers had to demonstrate to the Department of Munitions and Supply that a snowmobile was essential to their

livelihood. Otherwise, they would not be granted the necessary permit to purchase a B7 or B12. Under these severe restrictions, production at Bombardier facilities dropped from 70 units in 1940-41 to 27 in 1942-43.

Thus, while valuable time was ticking away on his 17-year patents on the traction and suspension systems for snowmobiles, Joseph-Armand had to find a way to merely survive for several years. He found this path by responding to the military's interest in vehicles for winter battlefields. Over the course of the war, Joseph-Armand redesigned the B12 to serve as a troop carrier (called the B1 by army engineers) in Norway. In May 1943, he put the finishing touches on his ultimate military machine: the Mark I. It was an all-terrain vehicle equipped with a 150-horsepower Cadillac engine and two one-meter-wide traction treads on either side, each wrapped around four wheels and the sprocket device. The machine was used for reconnaissance and haulage in the swamps of Italy and the South Pacific.

The contracts to produce Bombardier's war machines went mainly to larger companies capable of volume production on tight schedules, but Joseph-Armand was put in charge of supervising the manufacturing at plants in Montreal. He would have preferred the contracts to go to his firm in Valcourt, but the military could not wait while his operations were refitted. Nevertheless, the Valcourt plant did get some prototype work and subcontracts for parts, which helped keep it going during the war.

In his dealings with the government, Joseph-Armand realized he would be in a better legal position if he incorporated his company. One benefit, for example, would be limited personal liability in the event business transactions went awry. Consequently, Joseph-Armand incorporated a company under the name of L'Auto-Neige Bombardier Limitée on July 10, 1942. Authorized share capital was set at 3,000 shares. At the time,

the only shareholders were Joseph-Armand, Secretary-Treasurer Marie-Jeanne Dupaul, and Joseph-Armand's brothers Alphonse, Léopold, and Gérard. Shortly afterward, Joseph-Armand's oldest son, Germain, and an engineer, Roland Saint Pierre, became shareholders as well.

During the war, Joseph-Armand was to experience a bitter disappointment. Having Canadian and US patents on technical innovations used in the B1 and B2 models, he expected to earn a stream of royalties as the vehicles were manufactured and put into service. But the Canadian military refused. After some wrangling, Joseph-Armand's lawyer extracted a concession from the military to pay $2,000 to cover all past and future claims. Joseph-Armand was outraged. He refused to accept the offer and seriously considered suing. But quite weary of the protracted dispute by this time, he just let it go.

After the war, controls were dismantled and business improved for Bombardier's Valcourt operations. By 1945-46, production had soared to 230 units, yet again stretching the plant's capacity. Customers had to wait weeks, sometimes months, for delivery. So another decision was taken to expand. In 1947, a much larger assembly plant was opened, with an annual production capacity of 1,000 units.

Two new models helped fill the plant with work orders. The 12-passenger B12 was popular in public transport, freight hauling, mail delivery, and ambulance services. Over 1,500 were sold between 1945 and 1952. The C18, a larger version of the B12, was first used by school boards in Quebec's Eastern Townships to transport children to school during the winter.

It now looked as if Joseph-Armand was finally on his way. In 1947-48, company sales reached $2.3 million, and profits went to $324,000. Once again, however, just when everything was looking rosy, Joseph-Armand's company was dealt a severe blow. Actually, it was two hard knocks: 1) the winter of 1947-48

was virtually snowless in Quebec, and 2) the provincial government of Quebec passed a law that committed government authorities to keeping highways and local routes open to automobile traffic all winter. As a result, L'Auto-Neige Bombardier's sales dropped by 40 percent to $1.3 million in 1948-49.

The snow might return the next year, but so would the snow plows. It was a grave crisis, and something had to be done. Joseph-Armand decided that salvation lay in the development of new products. He retreated to his newly built research center in Kingsbury, not far from Valcourt. He worked at a grueling pace developing a snow-clearing machine and then passenger vehicles (the C4 and B5) for traveling over asphalt, gravel, and snow. But he came up dry.

However, perhaps the greatest disappointment was the failed effort to realize his long-held dream of creating a light and rapid vehicle for carrying one or two persons over snow wherever it might be, on or off the road. The main obstacle had been the size of the engines then available—they were too heavy and unwieldy. So Joseph-Armand set about trying to design a small one that was powerful enough to handle the job. By 1949, he had his engine built and used it in several trial runs in what was a forerunner to the Ski-Doo of the 1960s. But the prototype never went to market because the engine was deemed too complicated for mass production.

As the company fought to pay off suppliers and forestall layoffs, the mood at the plant became increasingly grim. Tensions arose among the shareholders over the proper course of action. Joseph-Armand's fruitless research and the ongoing decline in the company finally led him to accept the advice of his doctor to leave the business in the hands of his brothers while he rested in Florida for a few weeks. When he returned, the situation was worse, but at least he was rested and ready to accept the challenge again. And to reassure creditors, he invested more

of his own money into the company. Joseph-Armand was now fully aware that his business would remain precarious as long as it depended on the vagaries of snow conditions. He realized that his company would have to diversify, not only to get through the present crisis, but as an insurance policy to cope with future eventualities. A one-product enterprise might enjoy rapid growth for a time, but it was vulnerable to collapse if its market went through a downturn. Some stability would be brought to the firm if it could branch out to other product lines serving different markets. That way, a disruption in a particular product line would not become life threatening as it would be offset by other products in other markets.

He finally got a break in his search for new markets. One of his brothers, Théophile, had a tractor that was constantly getting stuck on soggy parts of his land. So he and another brother, Gérard, took up the challenge of improving its traction for all types of ground conditions. They added a wheel in between the rear and front wheels, and draped a track over it and the rear wheel. It was a simple solution, but it was very effective. Upon returning from his Florida vacation, Joseph-Armand helped Gérard with further improvements, and the Tractor Tracking Attachment was soon ready for sale to farmers. It was an immediate hit and brought a revival in company sales.

Meanwhile, Joseph-Armand pushed ahead with research into all-terrain vehicles for the mining, oil, and forestry industries. He went on trips to remote regions to observe transportation needs. This led to a remodeling of the B12 to create the BT, which had a small cabin at the front and a large platform for hauling logs and other cargo. There were other machines, but the biggest winner was the Muskeg Tractor, which first rolled off the assembly line in 1953.

The Muskeg was developed after Joseph-Armand witnessed the need for more effective methods of transporting oil drills,

seismographs, and other supplies over the snow and swamps of the recently discovered Leduc oil fields of Alberta. Use of the Muskeg gained broad acceptance in other resource industries as well as in the construction industry for the building of telephone lines, roads, railways, and other infrastructure in regions with difficult terrain. It also became an international success. It could be found, for example, cutting weeds on the banks of the Danube and clearing sand dunes from roads in the Sahara desert.

What made the Muskeg and Bombardier's other industrial machines possible were a couple of key inventions in the research labs in Kingsbury. One was the design of a new rubber vulcanizing machine that permitted the production of a seamless and shock-resistant track. The other was the invention of an unbreakable and warp-proof all-rubber sprocket. With these inventions, the problem of breakages in the track and sprocket were resolved. Durability for all-terrain travel was achieved.

Of all his industrial vehicles, Joseph-Armand derived the most satisfaction from the Muskeg. "The Muskeg moves easily in muskeg where it would be dangerous for anyone to venture on foot. It is our greatest success," wrote Joseph-Armand in a specifications note.[3] The introduction of the Muskeg began a very profitable period for Joseph-Armand's company. In 1958-59, it helped earn profits of $825,000 on sales of $3.5 million. Joseph-Armand was now a multimillionaire. He had outlasted a series of setbacks to finally reap the rewards of a persistent and inventive talent.

But his greatest success was still to come: the invention of a lightweight snowmobile called the Ski-Doo, which was able to take one or two persons virtually anywhere there was snow. Joseph-Armand originally saw the machine as a replacement to the dogsleds used by trappers, prospectors, missionaries, and other persons in the North. However, it became much more

than that. The affluent 1960s turned it into a hugely popular recreational vehicle.

By the late 1950s, engine technology had improved to the extent that small and efficient engines were viable. Some models had become available on the market, leading Joseph-Armand and his son Germain to renew their efforts to design a small snowmobile. Also encouraging them in this direction was the invention by Joseph-Armand's son of a seamless, wide caterpillar track. Following experiments with several prototypes, their first "miniature snowmobile" went on sale in the fall of 1959. The name originally assigned was Ski Dog, but a typographical error on brochures changed it to Ski-Doo. Joseph-Armand thought this sounded better, so the accidental name stuck.

As the marketing and distribution network was built up, sales accelerated each year, from 225 in 1959-60 to 8,210 four years later. The rapid growth brought on successive waves of expansion and reorganization at the Valcourt facilities. In 1962-63, the appeal of the Ski-Doo model was enhanced with a major upgrade: a fiberglass cab and a more powerful engine.

The market could have absorbed many more Ski-Doos, such was the rage for them. If Joseph-Armand had been a less conservative fellow, he might have boosted capacity even faster to keep up with the demand. But he had taken to heart the lessons learned from past shocks—government rationing in 1941 and provincial legislation in 1948 requiring the plowing of public roads in winter. He did not want to place all his eggs in one basket and become dependent on one product again. To chase the Ski-Doo euphoria would require diverting resources away from the industrial line and letting its significance dwindle. Prudence dictated a policy of balanced diversification. Accordingly, he slowed down promotion of the Ski-Doo to prevent it from overtaking company resources at the expense of other initiatives.

Unfortunately, Joseph-Armand was not around to see how well his company would prosper throughout the remainder of the 1960s. By the time his persistent stomach pains were correctly diagnosed as cancer, it was too late. He died on February 18, 1964, at the age of 56. Nevertheless, he departed at the pinnacle of his career, leaving behind a thriving, robust business, with profits of $2 million on sales of $10 million in 1963-64. And the firm was ready to take on whatever misfortunes lurked ahead in the unfathomable external environment. The manufacturing of the Muskeg and other industrial vehicles provided a solid revenue flow, while the Ski-Doo offered superb growth potential.