

The early days of the Ampex Corporation

As recalled by JOHN LESLIE and ROSS SNYDER

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As many AMMPT members and others have Ampex equipment in their collections, it is expected these articles will be of interest to them.

SYNOPSIS:

Alexander M. Poniatoff founded Ampex in 1944, primarily to manufacture small motors and generators for military applications. When WWII ended, the military contracts dropped off, and Alex had to search for a new line of business to continue his company's existence. He and his small group of engineers heard a demonstration of a Magnetophon, a German magnetic tape recorder used by Hitler during WWII. The demonstration quickly convinced Alex to redirect his company and soon it was designing and manufacturing professional-quality magnetic tape recorders. Bing Crosby was a great help in Ampex's early years. The company grew quickly and, within a short time, dominated the magnetic tape recorder market in radio, television, the record industry, and industrial and military markets for instrumentation recorders.

INTRODUCTION:

It has been amazing how many people today are asking questions about Ampex and the Company's contribution to the music recording industry, the radio and television broadcast industry and the stereophonic home entertainment field. There is no question that Ampex was a major factor in each of these areas, but that was some 50 years ago. The Company was founded in 1944 and had established an outstanding reputation as a producer of high-performance, magnetic tape recorders by 1950. Today, only four of the original engineers are still alive: Frank Lennert, John Leslie, Walter Selsted and Myron Stolaroff. The four of us know that 50 or more years ago, we made a contribution to the world, but as we look back today, we see ourselves as having been in the "Model T Ford" days of electronics. Another key person, during the early days, was Ross Snyder. He joined Ampex in 1952, and quickly made contributions as product manager of audio, theatre, and video products. We (John Leslie and Ross Snyder) with much help from our colleagues, will recall here the people and the events of Ampex's early years.

1. ALEXANDER M. PONIATOFF-COMPANY FOUNDER

Any serious discussion of Ampex must bring Alexander M. Poniatoff into the picture. He was the founder of the Company and a major stabilizing force through both the good times and the not-so-good times of the early years. He was an excellent listener, and as an engineer, was always looking for something new on the forefront of technology. He was a role model for the rest of us; we not only respected him as the President of the company, but we liked him and enjoyed working with him as well. Alex was born in Russia in 1892. His father was well-to-do, and sent Alex to Germany for an

education in engineering. After college, he returned to Russia

1.1 Manufacturer of Small Motors and Generators

Alex was an expert on electric motors and generators, and helped Dalmo Victor develop a product line of small motors and generators for use primarily by our military during World War II. Alex and company president Tim Moseley thought it best to set up a small operation outside of the mainstream of Dalmo Victor to manufacture these motors and generators. In 1944, Alex and Tim established Ampex Electric and Manufacturing Company. "AMP" are the initials of Alexander M. Poniatoff, and he liked to say that "the EX was for excellence." They split the ownership so each owned 50 percent. The new company moved to 1155 Howard Ave., San Carlos, CA—about a block from Dalmo Victor. In 1946 they shortened the name to Ampex Electric Corporation, and in 1953, the name was shortened still further to Ampex Corporation.

The little company did quite well, but as World War II came to an end, so did the bulk of the military contracts. Alex knew he had to develop some new motors in a hurry to keep his company alive. He turned to nearby Stanford University for help and was able to obtain, as a consultant, a professor with expertise in motor and generator design. It soon became apparent that Ampex needed a full-time motor specialist, so he asked the professor if he thought any of his graduate students may be suitable. Alex was very lucky! The professor recommended Myron Stolaroff, who was born in 1920 and had received a Master's degree in electrical engineering in 1942. At that time, Myron was working for the US Navy's Bureau of Ships in Washington, DC. With the war ending, Myron was eager to return to California, and as luck would have it, he had contacted his old professor friend to ask for suggestions about where he might find employment. Alex telephoned Myron, and he was hired on the spot. This was 1946. Myron thinks he was the only person ever hired by Ampex without a face-to-face interview. Myron made major contributions to the motor business and became a key advisor to Alex in helping point the company in a new direction.

1.2 The Search For a New Business Opportunity

With the war over, Alex and Myron both anticipated that the key motor-manufacturing companies would likely get into the business of producing small motors and generators—which had been Ampex's specialty—and there was no way that little Ampex would be able to compete. Ampex had to look for a new business opportunity. This is the time when Harold Lindsay entered the picture. Back when Alex was still at Dalmo Victor, one of his neighbors was Charlie Litton, owner of Litton Industries, then a manufacturer of vacuum tubes and other electronics. Sadly, one night the Litton building caught fire and burned to the ground. Afterward, Alex talked to Charlie and said, "If you have any good engineers who will be looking for a job, have them apply at Dalmo Victor". Harold Lindsay did and was hired.

Harold was born in 1909 and was an excellent mechanical engineer. He had worked for both Shell Development Corporation and the Radiation Laboratory of the University of California (now the Lawrence Berkeley National Laboratory) prior to joining Litton Industries. His personal interests were in high-quality sound systems, including phonograph pickups, turntables, amplifiers, and loudspeakers. Harold was an absolute perfectionist in everything he did. Alex and Harold became very good friends. Early in 1946, Alex and Myron

thought Harold would be an excellent person to join them in,

only to see his country become engaged in a civil war. He escaped to China, where he went to work for the Shanghai Power Company. He immigrated to the United States in 1927 where he worked for General Electric, Pacific Gas & Electric, and the Dalmo Victor Corporation in San Carlos, California.

thinking of new product areas to consider. Harold—although still working for Dalmo Victor—was happy to help his friends.

One of Harold's hobbies was to set up his sound system at Tilden Park in Berkeley and play records of classical music. Harold's system had a transcription turntable and dynamic phonograph pickup, which were the same as those used by the best broadcast stations of the era. He had power amplifiers with extremely low distortion and coupled them to Altec Lansing Iconic loudspeakers, which at the time were widely considered to be the best money could buy. It was truly a treat to hear music played over his system, and his Tilden Park concerts attracted huge crowds.

Walter Selsted also became very active at Ampex. John Leslie first met Walt in 1935, when they were both 14 years old. Both had an interest in radios, amplifiers and loudspeakers, which became the starting point of their lifelong friendship. Walt graduated from the University of California, Berkeley with a degree in electrical engineering in 1944 and worked for the Radiation Laboratory at UC for the rest of the war years. Walt and Harold Lindsay became good friends during their time together at the Radiation Laboratory. At the end of the war, Walt became chief engineer of a new company, Pacifica, which was attempting to open an FM station in the San Francisco Bay Area. Walt designed and supervised the construction of FM station KSFH, one of the first five FM stations built in the Bay Area. Walt was assisted in this work by another friend, Frank Lennert.

Harold Lindsay introduced Walt to Alex Poniatoff, and Alex asked Walt to become part of his brain-storming group—along with Myron and Harold—to explore new product areas. The group seriously considered products for the high-end consumer high fidelity sound system market. John Leslie was not a member of the group, but did visit with them and met Alex, Myron, and Harold in the process. Harold pushed very hard for Ampex to go into the high-end consumer market because of his love for such products. Soon though, thoughts of going into that market were scrapped.

1.3 Magnetophon Demonstration

On May 16, 1946, Jack Mullin, an associate of Palmer Films in San Francisco, gave a demonstration of one of two German Magnetophons that he had brought back from Germany. His presentation was made at meeting of the Institute of Radio Engineers (IRE, now the IEEE) meeting in San Francisco. Harold Lindsay, Walt Selsted, Frank Lennert and John Leslie were all in attendance. (Alex and Myron were not able to make it). Along with everyone else in the audience, we were overwhelmed by the wonderful sound quality.

During WWII, Jack Mullin was a major with the US Army Signal Corps and was stationed in England. He often heard classical music on Germany radio that sounded as if it were being performed live for broadcast. He couldn't believe that all of what he was hearing could be live, and questioned what was really happening. After the war, the Signal Corps asked Jack, who was then stationed in Paris, to go to Germany and explore their electronic activities. Jack, an electrical engineering graduate from Santa Clara University, welcomed the chance. Once in Germany, he and a colleague found magnetic tape recorders and tape that were used by the Germans for the "live" broadcasts. The mystery was solved! (It has also long been rumored that the Magnetophon was used by Hitler to record some speeches for later broadcast). Jack received permission to take two recorders (there were many) and ample rolls of tape

home for his own use. He disassembled the mechanical parts,

A day or two after Jack's Magnetophon demonstration, Walt took Alex Poniatoff to Frank Lennert's home to show him a record player that Frank had built. (Frank was born in 1924. He had been interested in electronics since his early high school days.) He designed and built his own recording equipment so he could record programs off the air. After he received a degree in electrical engineering from University of California in 1947, he went to work at a recording studio. He also worked with Walt at KSFH. Alex was interested not only in Frank's record player but also in Frank's overall abilities. Walt and Frank spent much of that evening telling Alex about the Magnetophon demonstration. Alex was intrigued and called Jack Mullin, who was going to give another presentation in Los Angeles. Alex went to hear it and was very impressed.

A few days later, Alex, Harold, and Myron went to Palmer Films for a private showing. Jack told us, sometime later, that Harold wondered if the great sound wasn't because of the speakers. It was only after they found out that the German speakers were rather ordinary that they were able to come to the consensus that the Magnetophon was indeed the outstanding component in the chain! Then it didn't take long for the group to decide that Ampex would be going into the tape recorder business. Jack Mullin felt obligated to help anyone who could use his knowledge of the Magnetophon because his work in bringing it out of Germany was performed at the taxpayer's expense. Jack never received any financial compensation from Ampex for his help. He became a very good friend and eventually became chief engineer of Bing Crosby Enterprises—a company that later became a sales representative for Ampex.

1.4 Ampex to Manufacture Magnetic Tape Recorders

Once the decision was made to go into the magnetic tape recorder business, a number of months went by as Alex, Myron, and Harold established a plan to make it happen. Harold was convinced that if he could be successful in making a playback head (he thought it would be more difficult than the record head), he could design the rest of the tape transport. In early fall, Alex hired Harold on a full-time basis to start the head development. By December, 1946, Harold had constructed a playback head that could be interchanged with the one on the Magnetophon. He took it to Palmer Films. They first played a recording using the German head, and again with Harold's playback head. Everyone cheered—Harold's sounded better!

1.5 Design Of The Ampex Model 200A Begins

Now that Alex, Harold, and Myron knew that they could produce the playback head, they began in earnest to design and build the rest of the machine. Harold was responsible for the mechanics and Myron the electrical and electronic parts. They had a couple of technicians on hand to assist, but it really was a two-man development. Harold and Myron both realized that they needed to produce a machine that was superior to the Magnetophon. (Several run-of-the-mill tape recorders that used magnetic oxide-coated paper tape were already on the market, such as the Brush BK-401. These recorders had already given magnetic tape a poor reputation among professional users). Harold and Myron worked 12 to 14 hours per day for a period of over a year to reach their goal. Harold concentrated on the heads, capstan and other mechanical details. Myron used his motor expertise, and collaborated with motor manufacturers (who, at the beginning, were reluctant to

participate) to develop reel motors and capstan motor drives.

including the motors, heads, and so on, and boxed them for shipment to San Francisco. He also included instruction manuals and schematic diagrams so he could duplicate the electronics back in California using American components.

were close to butter-free when moving the tape. Jack Munn proved to be a great help, making available the circuitry of the Magnetophon and offering suggestions for improvements to that circuitry.

Despite that minor setback, Jack Mullin encouraged them to take the prototype to Los Angeles and set it up in Bing Crosby's studio at the American Broadcasting Company (ABC) at Sunset and Vine in Hollywood. Jack thought it would be a perfect time to demonstrate the Ampex machine to Bing and his associates because this was the first night of the 1947—1948 Season, and Jack could play back a portion of the first night's recording prior to air time. The recording had been made on one of the two Magnetophons that Jack was using to record Bing's radio shows. Jack played it on the Model 200A prototype and everyone was very impressed. Fortunately, no one asked Jack to record anything.

Bing Crosby knew that it was imperative for him to have his shows recorded in such a way that no one would be able to tell that his show wasn't live. Jack Mullin had made it clear that his two Magnetophons were mighty tired and difficult to keep working properly. The Ampex 200A was the answer to Bing's dream. In those days, Bing had to do two "live" shows, one for the Eastern time-zone and the second, three hours later, for the Pacific time-zone. Bing, being a rather laid-back individual, knew he had difficulty enough getting through one show error-free, so repeating it three hours later would be next to impossible. Obviously, being able to record and edit was a necessity.

1.6 Bing Crosby Places an Order For Ampex Recorders

Crosby placed an order for 20 recorders at \$4,000 each with a 60 percent down payment; he wanted them as soon as he could get them. In this way, Bing helped finance Ampex's first production-run of 20 recorders. When ABC learned how well the Ampex 200A performed and how reliable the recorders were, they were eager to purchase units for use in similar coast-to-coast time delay of other broadcasts. Bing helped them by selling many of his 20 recorders to ABC.

Harold and Myron still had a lot of work to do to get the Model 200A into production. Myron was quite pleased with the electronics he had designed. The schematics of the Magnetophon and other information provided by Jack Mullin were especially helpful, as was the work Jack had done to improve the Magnetophon's record/playback electronics. Harold was able to solve the record problem mentioned earlier, by seeking help from Walt Selsted.

1.7 Change in Ownership Helps Finance Future Growth

In 1948, Tim Moseley decided that he wanted to sell his half of Ampex. He sold to Joseph and Henry McMicking and their Ayala Associates. This arrangement was a good move for Ampex because the McMickings were venture capitalists, had connections to other sources of funding, and were able to take the company public when the time was right. They helped provide the necessary capital to meet the company's expanding needs, as well as experienced management personnel that helped steer the company toward future growth.

In early 1948, Ampex was ready to start production. They had only a half dozen people in the plant, so were greatly concerned as to how they would make it happen. They didn't even have enough technicians in their employ to assemble and test the electronics that Myron Stolaroff had designed. They sub-contracted the electronics to a small company in Lafayette, California, about 40 miles from San Carlos. That company was Pedersen Electronics which was owned and

operated by Rudy Pedersen and John Lassie. There were

Alex then asked Frank Lennert for his help, and Frank joined Ampex in early 1948. He was the company's first electrical engineer with an electronics background. Frank helped greatly in checking out the machines. He also worked closely with 3M to evaluate new batches of tape that they were developing for use in the exciting new field of professional magnetic tape recording. By the time Frank checked out the first production 200A, he was using 3M's new RR tape which was better than the tape Jack Mullin had brought back from Germany. Frank also relieved Myron of some of his electronic responsibilities, so that Myron could begin concentrating on both sales of the Model 200A and planning for products beyond the 200A.

1.8 Model 200A Shipments Begin

Ampex delivered the first production Model 200A in April, 1948, to Jack Mullin; the second recorder followed a few days later. Jack used serial numbers 1 and 2 for recording the Bing Crosby Show. Many of the rest of the first production run of 20 went to ABC in Chicago where they were used mainly for broadcast time delay. It is interesting that Ampex put Serial Numbers 13 and 14 into portable cases (movable would be a better word; they were large and heavy) and shipped them to Bing Crosby Enterprises. Jack Mullin had now become chief engineer there, and he proceeded to cannibalize one of them and modify it to work as a transport for a video recorder he was developing. It was an interesting experiment although it was a failure, and the idea was abandoned. Serial Numbers 13 and 14 became historical units as they were the only two "portable" Model 200A recorders ever made!

Although everyone seems to talk about the "Model 200", each recorder shipped was a Model 200A. This recorder used 14 inch open flanges (See Fig. 4), 1/4-inch tape with oxide facing outward, and ran at 30 ips. Frank tried operating the recorder at 15 ips, with a suitable change in equalization, but felt the results were not of professional quality, mainly due to the limitations of 3M RR tape. 15 ips remained impractical until about a year later when 3M introduced its 111 tape. (There is some confusion in the industry about 3M RR tape and 3M 112 tape. RR was the designation of an experimental batch of magnetic tape. 3M later listed it as 112 so the latter tape actually preceded the introduction of 3M's much improved 111.)

2 INTRODUCTION OF MORE PRODUCTS

Myron, wearing his sales hat, thought Ampex should take advantage of the knowledge they had gained with the Model 200A and have the second product be a less-expensive recorder that would have a target sales price of \$1,500.

2.1 Models 300 And 301

Harold and Frank went to work on this new product—what would become the Model 300. Harold was building heads for a 200A in the morning and Frank was checking out the recorder in the afternoon—and shipping it that evening. For the Model 300, Harold did the mechanical part and Frank did the electronics, including the record/playback electronics. It used 10.5 inch reels, 1/4-inch tape facing inward, and was a two-speed machine switchable to either 7.5 or 15 ips. Harold designed a new head that, when compared to the one for the 200A, was less expensive, performed better and was more uniform from head to head. The new head made tapes more easily interchangeable from machine to machine than was possible between 200A

recorders. The first production Model 300 was shipped in late

approximately September, 1947. At the time, both of them were only a year away from receiving their electrical engineering degrees. Rudy and John teamed up to assemble and test the electronics for the Model 200A (and later, for the Model 201).

Spring, 1947. A 15/50 ips version, the Model 301, was introduced shortly after that. The 300 transport became the platform for many versions of both audio and instrumentation recorders. About 20,000 of these transports were produced.

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Tapes were not interchangeable between the 200A and the 301 due to several factors. First, the tape on the 200A had the oxide facing outward, whereas on the 301 it faced inward. Second, the record equalization was different, and the 301 was designed to use 3M 111 (again, the 200A used the 3M RR/112 tape). It became embarrassing that the Model 301 had better frequency response, lower noise, and lower flutter than the 200A. Sales of the Models 300 and 301 quickly outstripped those of the 200A, which was soon phased out; in the end, a total of 112 Model 200A recorders were manufactured and shipped.

2.2 Model 201—An Upgrade for the 200A

Frank became concerned about all those 200A recorders that were being used in the field, now that the 301 was available. He decided to make a conversion kit for the Model 200A that would solve these problems—at least to a great degree. This different configuration became known as the Model 201. The kit consisted of a 301 head assembly, new electronics that had circuitry similar to Models 300 and 301 and that would plug into the same slots as the original in the 200A cabinet, and finally, a two-speed motor conversion for 15 ips or 30 ips—the same as the Model 301. The 201 then required the use of 3M 111 magnetic tape—again, the same as the Model 301. Frank also included a provision for equalizing for RR/112 tape if required. By early 1949, the financial situation for Ampex had improved considerably as a result of shipments of the Model 200A and Model 201 conversion kits. Alex was now able to do something he had wanted to do for some time: hire Walter Selsted.

2.3 Instrumentation Recorders

Shortly after the Model 301 was released, Myron received an order for a special 301 that was to be used for recording telemetry data where the power level was constant across a 30 to 15,000 Hz bandwidth. The special 301 also had to record seven separate channels of this data simultaneously. Walt Selsted found that the concept Harold Lindsay had used for his most recent head design for the 300 and 301 could also be applied to the development of a head assembly that could record and playback seven tracks on a 1/2-inch wide magnetic tape. Walt also learned that the 301 tape transport could be modified to work perfectly with 1/2-inch tape.

The standard 301 electronics were designed for audio recording, where high frequencies are pre-emphasized during recording and equalized in playback to provide a flat frequency response with reduced audible noise. (This is practical because the power level of high frequencies is much lower than the power level of mid and lower frequencies.) Walt modified the transport for 1/2-inch tape, put on a 7 track head assembly, removed the preemphasis in record (for instrumentation applications, the power level is often constant across the frequency spectrum) and re-equalized the playback for flat frequency response on all seven record/playback electronic assemblies. The recorder was shipped in late 1949, and was both Ampex's first multi-channel recorder and its first instrumentation recorder shipped by Ampex. It was the beginning of a highly successful instrumentation business that Ampex was to enjoy for many years to follow.

Myron Stolaroff then went to New Mexico to drum up more sales. He stopped by to see a former classmate from his days at Stanford. His friend worked at the White Sands

Myron's friend asked if an Ampex machine could record seven channels on a magnetic tape where the frequency response was DC (0 Hz) to a few hundred Hz. He said that if he had such a system, it would make a world of difference in their analysis work because they could connect the magnetic tape recorder's electrical output signals to a computer. Myron returned to Ampex and discussed the subject with Walt. His answer: "How soon do they want it?"

Orders for special recorders were coming in rapidly and engineering was having trouble keeping up with the workload. Alex Poniatoff telephoned John Leslie and asked how soon he could come and help. John Leslie joined Ampex in February, 1950 and became employee number 32 on the payroll. As mentioned earlier, John had helped build the 200A electronics while finishing his college education. He was born in 1921 and built his first radio when he was nine years old. He built his first 60 watt power amplifier when he was fifteen. Electronics were always his hobby—even today! In 1942, John enlisted in the Navy and they saw fit to put him immediately into teaching electronics in the Radio Materiel School on Treasure Island in the San Francisco Bay. He is one of few who never went through boot camp. After the War, he returned to Berkeley to earn his degree in electrical engineering. Upon graduating, he became a field engineer for the Radio and Television Division of Bendix Aviation Corporation and covered California and Nevada.

In addition to the White Sands order, Myron had landed a number of other orders for instrumentation recorders. One was a recorder designed to withstand very high air blasts and record from DC to 3,000 Hz. It was to be used to record atomic bomb blasts. Another was a recorder designed to record many channels of geophone signals used for oil exploration. Still another was an eight-channel recorder—seven for data and one for voice—for use by the Army. The recorder could be mounted on any vehicle—tank, truck, troop carrier, and so on—that they wished to test on their Aberdeen Proving Grounds. The vehicle may be destroyed, but the recorder must provide data on what happened during the process. That eight-channel recorder was John Leslie's first project at Ampex. He had an excellent team working with him. One real standout was a 17-year-old high-school student who worked part-time. His name: Ray Dolby.

In 1950, Walter Selsted took on yet another project: an extremely low-flutter recorder for the Navy. It used Walt's concept of a capstan drive system in which the heads contact the tape right at the capstan. It was the first of its kind and especially important for instrumentation recorders using an FM recording technique. In that case, flutter constitutes undesirable noise, which of course is the major factor in a signal-to-noise measurement. This recorder became the Ampex Model 500 and was, we believe, the lowest-flutter recorder made for many years.

Many of the instrumentation recorder projects in 1950 involved recording down to DC. Ampex developed an FM recording system using a multivibrator to provide a carrier frequency to be recorded, and that frequency could be modulated at any rate from 0 Hz (DC) to the maximum required. Of course, the signal then had to be demodulated in playback. This same FM record/playback system was used for a decade or more in Ampex instrumentation recorders. A

Proving Grounds (now White Sands Missile Range) Myron

varied in 1950 used in the Ampex videotape recorder

subsequent new method of recording data, commonly
launches and other research projects, was by optical recorders
and pen recorders. Each was a seven-channel recorder, and
once you had a recording, all you could do was look at it.

introduced in 1960.

(To be continued)