EQUIPMENT DEVELOPMENT AND SALES

REFERENCES (FILE FOLDERS)

B-1	PORTABLE NDB	1970 - 1972
B-2	LWX-100 FIELD PROBLEMS	1973 - 1976
B-3	NDB - APPLICATION NOTES	1970 - 1978
B-4	LWX-100 UPGRADED TO LWX-100A	1978
F-1	FMX-78S PROPOSALS	1979 - 1980
F-2	FMX-1230? FUTURE REQUIREMENTS	1979
F-3	SEA LAB 7800 INVESTIGATION	1979
F-4	FMX-625 DEVELOPMENT	1980
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F-6	FMX-1200L DEVELOPMENT	1980
F-7	FMX-75S DEVELOPMENT	1980
F-8	FMX-1201 DEVELOPMENT	1981
F-9	FMX-76? INVESTIGATION	1981
F-10	FMX-95S DEVELOPMENT	1981
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S-1	TRAIL RADIO DEVELOPMENT	1976 - 1977
S-1-1	SBX-100 SERIES DEVELOPMENT	1979 - 1980
S-2	SBX-151 SERIES DEVELOPMENT	1980 - 1981
S-3	SBX=100 ENHANCEMENT	1980 - 1982
E-1	ENGINEERING PROGRESS MEETINGS	1978 - 1981
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SECTION I

SPILSBURY & HEPBURN LTD.
SPILSBURY & TINDALL LTD.
SPILSBURY COMMUNICATIONS SYSTEMS LTD.
SPILSBURY COMMUNICATIONS LTD.

PRE-SSB COMPANY HISTORY

April, 1941. Spilsbury & Hepburn Ltd., incorporated. Address was 570 Cardero St. Operated from our own building (30' x 30') built on skids occupying C.P.R. trackage property, land rental $10.00 per month.

Hepburn looked after the office, did local service work, opened the mail and maintained radio communication with me on our service vessel, "Five B.R." in which I covered the coastline from Vancouver to Alert Bay.

We immediately landed a service contract with Edward Lipsett to install, maintain and repair all Kaar Engineering radio telephones for which Lipsett was the Canadian distributor. This was the first serious threat to the virtual monopoly enjoyed by Canadian Marconi up to that time. Lipsett sold a great many of these simple units to the fishing fleet. We hired several service men to handle the work. We were not authorized to sell; just install, service and repair.

1943. Lipsett set up their own service department and terminated their contract with us. This first looked like total disaster but we got busy and within two weeks we designed and built our first marine radio - the "MRT-75". It proved immediately successful and we subsequently built a considerable quantity. (I have seen some still in service as recently as five years ago). This was followed by other models, the "MRT-25" marine, "LRT-25" land, "MBL - 50" mobile and the "MRT-80" designed specifically for the B.C. Forest Service but used across Canada.

Our largest single order to that date was for over 100 special LRT-25 radios for the Bell Telephone Co., for use on the "Mid Canada Line" during the construction project (Dew Line).

Our manufacturing efforts required adding more people -- metal workers, and female assembly workers. Our 30' x 30' space became untenable, particularly as it contained no plumbing. We rented a 25' x 100' ex-hair dresser's establishment on Robson Street to take care of expansion. It had one toilet in the basement -- unisexual! The sales and service group at 570 Cardero St. were still referred to as "the camels".

Within about a year Edward Lipsett went completely out of the radio business. I made up my mind that never again would I allow the company to get into a position where "all our eggs are in one basket". Diversification became our objective and its attainment has saved us from disaster on more than one occasion.

Then came the need for a lower power, low cost, foolproof radio which would fill a need for communication up and down the coast, for stores, Post Offices, logging camps, airline agents, etc. etc. The AD-10 was the answer -- a little

larger than a lunchbox, a telephone handset on the top -- vibrator powered from a 6 Volt storage battery or 115 AC. Price $275.00 as I remember. It had two channels, 2292 KHz for handling radio messages to the government coast stations and 4495 KHz for semi-duplex to B.C. Telephone Co. A two frequency, off centre-fed, half wave antenna was part of the kit. Many hundreds were sold. They were rated at 10 Watts input. About 5 out.

Our largest unit was a 500 Watt linear amplifier, the LT-400Q Our smallest was the PRT-2, our first truly portable, designed especially for the engineering parties working back in the mountains on the original Kitimat hydro power surveys. This still used vacuum tubes and dry "A" and "B" batteries. It was supplied in a genuine leather case. Hundreds were sold all over Canada and particularly in the North. One was taken up Mount Everest with the first Canadian team.

This was later superceded by the PRT-20 -- similar in appearance and performance but "all solid state". Our first all transistor radio -- it even employed a printed circuit board! With the PRT-20 the sale of our portable radios continued to climb, and we became the acknowledged experts in the portable field -- world wide.

All of the above was in the pre-DOT era. No mandatory specifications to complicate life and inflate equipment costs. No need to involve the services of a professional engineer with the all important seal. We did not have one of course, and very few were around in those days.

About 1953 the DOT came out with R.S.S. 110 for compulsorily equipped vessels and R.S.S. 112 for non-compulsory. This gave us one year to dispose of all existing models and come up with totally new designs, costing on the average 40% more than the old ones.

The designs which followed were the MRT-400, MRT-700, etc. They plugged the hole but were plagued with much greater failure rates than the older, simpler units. They were not too well received in the domestic market and were seriously over-priced for most export markets.

During this period we out-grew our rented quarters on Robson Street and moved the whole company into a larger two-story rented building at 144 Water Street. We converted the original 30' x 30' building into a mobile radio service station operating 24 hours per day, trying to keep several fleets of taxis on the air. We were importing and selling the Comco VHF mobile sets. Later we started assembling Comco sets under license. It was a special kind of headache, but did represent diversification!

It was in 1957 that we moved to our present building at 120 East Cordova St. We seemed to have so much space that our voices echoed and we seriously considered sub-letting one floor!

SECTION II

INTRODUCTION TO THE SSB ERA

The changeover from AM to SSB did not come suddenly. In fact it was not until May, 1965, that DOT issued their circular establishing dates on which it would become compulsory to change to SSB. The international agreement had established December 31, 1981, as the Final. (See Appendix I.)

Why then did we get involved in designing, building and selling SSB nearly five years ahead of tim e? I asked the question and before I could answer it I had to do some digging. My findings are worth passing along.

Prior to 1960 the use of SSB was practically unknown in our type of industry. It was used in trans-oceanic telephone communications, and by the military to a degree. Ham radio operators had used it for years and most available technical information was to be found in the Ham periodicals - QST - 73, etc.

The advantages offered by SSB have always existed but the extra costs were difficult to justify.

SSB is much more effective than AM -

1. Because of its narrow band width -

    a) the signal to voice ratio is improved.
    b) the total number of channel allocations can be doubled.

2. Because the carrier and one side band are removed -

    a) only 25% of the power is required.
    b) multipathing and phase distortion are eliminated.
    c) Heterodyning of interfering signals is avoided.

All in all it is calculated that SSB for a given input power is at least eight times more effective than AM.

So even if the equipment cost per Watt is four times that of AM, the cost per mile of effective communication is only half that of AM.

The early SSB sets were difficult to tune and operate -- required considerable skill on the part of the operator -- no problem for licensed commercial operators, or for Hams, but a serious handicap for general commercial use. Improved methods of frequency stability and the introduction of automatic level and sensitivity controls finally produced equipment that could be used by the non-technical operator.

About 1960-61 we began to receive the occasional enquiry for SSB equipment. Mostly from firms like oil companies wanting long haul communication in the Canadian North.

RCA International were active in leading the movement. RCA Montreal bid on and received an order to design and build 150 units. This was the RCA-SSB-100,

4 channel simplex radio. The R.C.M.P. became interested and installed RCA sets in Ottawa, Regina, Winnipeg and Edmonton. They were dramatically successful and they expanded this network to all parts of Canada. The Hudson Bay Co. became interested -- also the oil companies already mentioned. Our supplier of VHF mobile equipment, Comco in Florida, listed a single channel, 100 Watt SSB. We brought some in. Our oil customers liked them and wanted more. Canadian Marconi were aroused and brought out a Japanese copy of the 4 channel RCA-SSB-100.

We then copied the Comco set but made it 6 channel, simplex and semi-duplex, thus leap-frogging both RCA and Canadian Marconi. This was our first SB-100 and we sold 32 the first year, 1963.

In the meantime RCA Canada built over 3000 of their SSB-100 units in Montreal, which were sold world wide through RCA International.

This initial plunge into commercial SSB by RCA was under the direction of their Industrial Sales Manager, none other than Rick Bergson, who later joined S&T after RCA closed their Marine Division in Canada.

SECTION III

SSB RADIOTELEPHONE EQUIPMENT, DEVELOPMENT AND SALE

1963 THE SB-100 SERIES

Basic design (borrowed) from Comco. Modified to provide six channels simplex and semi-duplex. Was used almost exclusively for land stations. Separate single channel transmitters, SBT-100 and single channel receivers, SBR-100 were also made and used in remote controlled land stations. This series enjoyed a sales life of four years and 156 units were built. The cost of development was minimal since we had only one engineer and we did not give him very long to complete his task. It is unfortunately about the only time we swallowed our pride sufficiently to copy an existing design.

1965 THE SB-60

The four channel mobile SSB was produced in response to our Sales Manager's (Louis Potvin) insistence that if we could build an SSB small enough to install under the dash of a vehicle and operate on 12 Volts, we would sell hundreds of them. No one else had such a product -- in the world!

No one knows what it cost to develop - all "engineering" was lumped together in those days. However, only Thorkelson and a junior technician were involved and they did many other things; but the undertaking was completed within a year of its start. The product itself was a real breakthrough.

It was, of course, all vacuum tube design in those days yet the four channel unit was smaller than present day solid state sets of similar performance.

The SB-60 series had an active sales life of nine years and 1133 units were built.

The SB-60 was expanded to eight channels in the SB-60H version. Both the 60 and 60H models were tested and approved by DOT for use in aircraft in Canada. A total of 295 were sold for use in aircraft. A DBS statistics report in 1970 showed that we had 92% of the total Canadian SSB aircraft market (excluding Class 1 passenger aircraft).

1968 THE SB-120

The SB-120 was developed to meet competition in the marine field. Over 100 Watts, to play the numbers game, and ten channel, simplex and semi-duplex. Once again the development costs are not known but I notice in some of the minutes of the production meetings of the day, Thorkelson was holding out for a full two months but management was pressing him to do it sooner. It certainly could not have cost very much.

Unfortunately it enjoyed a very short active life - five years, with 300 units built. Massive failures of the Croven crystal ovens starting in 1969 caused a serious and costly interruption of about two years before we were able to change over to new ovens especially manufactured by Snelgrove. We were just recovering from this when in 1971 DOC came out with the new specifications - R.S.S. 181, effective April 1st of that year.

It was not considered advisable to modify the SB-60 and SB-120 to meet the new specifications since in any event we were facing increasing consumer demand to convert from vacuum tubes to solid state.

At first it was planned to use the SB-120 tube transmitter in conjunction with an all solid state receiver which we already had "in the works".

We were precipitated into rushing into a new product before we were prepared to make the full change to solid state. We succeeded in securing a P.A.I.T. grant from the Federal Government to help us through the crisis. William Chester was put in charge of the accelerated engineering program under P.A.I.T. rules and overseeing. Thorkelson resigned -- his assistant followed. Chester was obliged to bring on an entirely new team, including Jim McCluskey and John Horsack, P. Eng. Neither of these gentlemen had any previous experience in H.F. design.

The program overran badly in both time and costs and we still had no products. Chester left the Company at this point and I put Fred Palidor in charge as Engineering Manager. Palidor managed to pull things together in a remarkably short time and wind up the project after we had exceeded an extension of contract.

Out of it all came two products, neither of which could be considered successful.

1973 THE SBH-125

A hybrid set (two tubes in the final) 10 channel, 120 Watts. In every respect the SBH-125 was obsolete before it was borne.

1. Marconi had produced their CH-25 hybrid set several years before.

2. Several manufacturers already had 100% solid state sets on the market.

3. Nearly all manufacturers had gone over to broadband tuning in the receiver input and transmitter output stages. The SBH-125 still used individually tuned plug-in coils. A fully equipped 12 channel SBH-125 contained 96 coils! The cost was horrendous.

4. Having a vacuum tube final amplifier required a high voltage power supply for each primary voltage. These were very costly and unreliable and required re-engineering several times.

The SBH-125 had a four year active life and sold 335 units. Fortunately for us, Cuba bought some.

SECTION IV

SSB PORTABLES

1967 THE SBX-10 PORTABLE SSB

Once the full advantages of SSB were understood, particularly the greatly increased effectiveness relative to primary power used, it was realized that the battery powered portable would come into its own, particularly if suitable devices could be found to permit fully solid state construction. We started searching.

About this time my friend, Syd Konigsberg, of Konel in California telephoned me and said he had someone in his office with an all solid state, 10 Watt, portable SSB and it worked like a damn! Syd was not in the portable business but knew that we were. The upshot was a visit from the designer, Clark, who demonstrated the unit to us. We took it out on the "Blithe Spirit" and talked all over the coast -- hand carried! It was truly amazing. The set was compact and looked relatively simple to build. He said he needed money to finish building his swimming pool so we settled for $5,000 cash for the design and the sample.

We handed the SB/10 (Clark's designator) to Thorkelson and asked him to get us into production ASAP. Thorkelson spent several months attempting to repeat the design, but without success. It transpired that during Clark's previous employment with TRW he had combed through several thousand of their power transistors to find a single matched pair that would work at HF frequencies, and these were what he used in the one and only sample.

Thorkelson had to start over from scratch and find new transistors, but eventually came up with the SBX-10, a single channel 1 Watt portable that appeared to work satisfactorily. We built and sold a total of 342 of these little sets and this got us established as pioneers in the portable SSB market.

In 1970 Thorkelson came out with the improved SBX-11 which was expanded to provide four channels, simplex or semi-duplex.

The present SBX-11A is basically the same unit but slightly modified to use more up-to-date devices when the original types became no longer available.

The SBX-10/11/11A series has now enjoyed a 15 year active life with annual sales still climbing -- surely an all-time record in this industry.

Total sales over the 15 year period are now over 6,000 units. Our only Canadian competition has been Canadian Marconi who came on the market with their CP-24 and then their CP-34. Neither were popular and both have now been withdrawn from the market.

While the SBX-11A has been successful in capturing 100% of the market in Canada, we have had by comparison only moderate success in selling the SBX-11A in the export market where we are faced with very low priced competition from some

U.S. made units. Wherever the SBX-11A has been sold, however, it has established an excellent reputation for performance and reliability, and it may not yet be too late to greatly expand its sale in the export market.

It has been suggested that because of its great age, the SBX-11A leaves us very vulnerable unless we do something to up-date it. This sounds reasonable but on the other hand no one has been able to come up with any really worthwhile improvements to warrant a redesign. Nice kind of dilemna for a change!

Any redesign undertaken today would probably cost a fortune. No one really knows the initial engineering cost of the SBX-11 but I seem to recall estimating Thorkelson's time at $16,000. Adding Clark's initial $5,000 gives us a figure of around $21,000. Amortized over 6,000 units, using the regular 5% engineering write-off, the SBX-11 must have recovered over $120,000 to date, and still going strong.

The only thing that occurs to me is IF the Enhancement program produces an efficient synthesizer unit -- with low battery drain -- at low cost, we could contemplate designing a new portable around it. With broad band tuning it could accommodate many more channels and might qualify in the military or quasi-military markets of the world. But it wouldn't be an SBX-11A anymore.

Improved antennas, new type batteries and solar charging should be part of the package.

1974 THE SBX-40

A five channel, 40 Watt set originally intended as a mobile and secondly as an aircraft radio. It was all solid state, but still employed individually tuned plug-in coils in both transmitter and receiver. This set was plagued with technical problems from the start and was too costly for the intended market. Once again Cuba came to our aid and bought some, but from what I understand have not yet got them all into service. We built a total of only 114 units during its three year active life.

1974 THE SBX-42

This was the same as the SBX-40 but was supplied with an aircraft type miniature control head. When we attempted to market this we found that it was less than acceptable.

1. Its dimensions were unsuitable for aircraft mounting.

2. It used coils instead of broad band tuning.

3. It had insufficient power. The competition were offering 100 Watts or over.

In spite of all this, some customers liked the set when used with our AC-31 or STA-300 antennas.

During the development of the SBX-42 we learned another very costly lesson. That is, how NOT to get aircraft approval!

We were informed that Canadian DOT and U.S. FAA had a "reciprocal agreement" whereby radios approved in one country are automatically approved in the other. Certainly we knew that many sets approved by FAA in the U.S. came right into Canada and were approved without question. We decided to go about it the other way and put the type approval procedure into the hands of Saperstein and Associates in Vancouver to obtain Canadian approval. This process took over 14 months with the set shuttling back and forth between Vancouver and Ottawa for environmental testing in the DOC labs in Ottawa. The total cost was over $12,000 but we finally did it. Ottawa was very pleased as they told us we were the first to do it this way under the new specs.

Then we applied for automatic approval in the U.S. and were turned down flat. Reciprocity is a one way street in this case!

A total of 53 SBX-42 were built and we gracefully bowed out of the aircraft market of which we had previously enjoyed a 92% share.

The exact numbers are not available, but over a period of years Cuba bought many hundreds of SB-60H and SBX-40 partially built kits, thus substantially improving our production picture.

1976 THE SBX-61/SBX-121 PRODUCTION

This was actually the SBH-125 in which the vacuum tubes were replaced by power transistors in the final stage. In our first attempt we could get only 60 Watts (the SBX-61), but in a short time we found suitable devices to produce over 100 Watts (the SBX-121). With this we managed to hold the fort until the new SBX-100 series appeared. In fact the SBX-121 is still being sold because it offers a greater frequency range than the SBX-100/151. During its five year active life, 205 units have been sold.

The SBX-121 has earned a good name in the field for reliability and general performance, but still has the disadvantage of plug-in coils and high cost.

1973 THE "TRAIL RADIO" CONTRACT

While we were still suffering the consequences of the SBH-125/SBX-40 debacle, a minor miracle occurred. We responded to a requirement of the Research Department of the DOC with an "unsolicited proposal" to design and develop a new concept of SSB radio aimed at supplying the requirements of the Northern Peoples (Inuit) of Canada.

This of course is where the SBX-11 had been used for years and where it is still used. The "Trail Radio" concept was to include many novel and advanced ideas in "frequency netting", "speech processing", etc., and was really right up our alley. The total contract involved about $180,000 nearly all paid by the Government. It took us about two years to complete, at which time we delivered two working models to the DOC where they still reside. None were ever manufactured. It did, however, provide us with a springboard from which to produce a whole new product line.

1978 We obtained an EDC "Inovative Grant" to develop a new series of SSB radios for land, marine and possible aircraft applications, based on using the "Trail Radio" design and modifying and repackaging it for commercial markets. Federal Government support amounted to $125,736. The program ran for two years.

1980 The SBX-100/101 and the SBX-151 radios went into production for land, mobile and marine applications. Plans to develop an aircraft model were dropped early in the program in view of what we considered to be a small and shrinking market. In the first two years a total of 240 units have been sold. Apart from the usual growing pains, the new product has met with moderate market acceptance.

It is unfortunate, however, that its introduction to the market coincided with a serious recession in both the fishing and commercial sectors, resulting in a very slow start.

1980 A further Federal Government grant was obtained from the EDP to update or "enhance" the SBX-100/151 series. This was mainly to add synthesized frequency control and to extend the operating frequency range to cater to the export market. At this date (1982) all Government funding for the project has been used but the program is being carried on with an anticipated completion date early in 1982.

The full sales potential of the "Enhanced" product is not yet known. A great deal has happened in this market since the development was undertaken, including new imported synthesized equipment selling at very low prices. A great deal will depend on the final cost of our new product (not presently known to me).

As an assistance in evaluating sales potential and production planning for the new SBX-152 series, the Bergson report of November 5, 1980, should be carefully read and understood. This report together with his 1978 five year forward summary of Canadian Marine SSB usage is attached to this section for reference.

Reading this rather prophetic report raises some doubt in my mind as to whether or not we may have allowed ourselves to stray from the initial objectives during the execution of this program.

On the other hand it should be recognized that at the very inception of the "Enhancement" program we were well aware that this was less of a plan to initiate new features, but more a means of "cleaning up" a less than satisfactory product design, and involving further Government financing to do it.

The original SBX-100 series contemplated future requirements for extended frequency range, and also for introduction of synthesization, both of which would be "dropped in" on a retrofit basis at some later date. This was to enable us to come onto the market with the basic Canadian set with the least possible delay.

When we review our decision to undertake the "Enhancement" program, I now wonder why we turned down the alternative approach, which would have been to buy or build under license, some other manufacturer's synthesizer design. Did we think we could improve over the others? Even Canadian Marconi didn't try to do it themselves but bought their design from someone else. We had already contacted Stephens in Seattle and he was prepared to discuss it. According to Jack Manon, the Stephens synthesizer design was one of the best on the market to that date.

How will ours compare, if and when we get it?

I repeat, please read the Bergson report very carefully and check it in detail against today's known market conditions before undertaking any substantial production of the product.

SECTION V

NON-DIRECTIONAL BEACON TRAMSITTERS (NDB)

Away back in history, probably in the early 1950's we built and sold the first of our own NDB's -- the LW-500 designed by Thorkelson -- all vacuum tube, single frequency, 50 Watt AM using a motor driven coding wheel as an identifier it quickly took over a major place in the Canadian market for such devices. Factory production books for that ara are not available to me but I am sure we built several hundred. These units were used all over Canada by both Government and private users. They proved to be extremely reliable and in fact many are still operating.

No DOT technical specifications covering this type of apparatus existed. Through the W.C.T.C. the DOC invited us to draft a copy of a proposed specification. This resulted in R.S.S. - 117, which became effective in March, 1974. Our transmitters passed with flying colours.

A specialized off-shoot of the LW-500 is worthy of mention. A Dr. Rootes, of the Department of Mines and Technical Surveys spent a number of years drifting around on ice-flows in the Canadian Arctic, and used our equipment on most or all of his expeditions. He badly needed a radio beacon so that aircraft could locate his camp in the fog. (They drifted many miles a day).

Our LW-500 served the purpose, but was too difficult to supply with the necessary power. For Dr. Rootes' specific requirements we designed a semi portable NDB. It produced 25-50 Watts output, using a pair of 2E24 quick-heat (filament type) tubes, and a transistorized power supply running off a 12 Volt storage battery. The NDB would be turned on only after being interrogated by the aircraft on radio -- to conserve batteries. The transmitter was housed in a plywood box -- fibreglass covered in bright orange. The antenna loading coil occupied another plywood box of the same dimensions. Dr. Rootes was extremely pleased with the performance and used them from year to year. Unfortunately he was, I believe, the only customer because of the very high cost of the "LWX-50". Would you believe the fibreglass covered boxes built for us by a boat builder were what put us out of the market? They cost more than the transmitter!

But the experience convinced us that we should design and produce the first solid state, portable NDB on the market. This should have been a pushover for us but we fell flat on our faces doing it.

1970. The Portable NDB requirement was defined, and a search for devices and components commenced. Our present engineering staff seemed reluctant to get involved. Our Chief Engineer at the time, John Hu, PHd., estimated $25,000 and 10 months would be required to design it. I was suitably shocked and consulted our Scientific Director, Dr. John McDonald, PHd., in fact asked him if his firm, McDonald Detweiler Assoc. would undertake it. He declined on the grounds that they had no one with H.F./LF experience on staff, but recommended

a contemporary of his, Garth Shearing, P.Eng., as having the required experience and capability. I approached "Shearing and Associates" and they agreed that the requirement was a very simple one and they undertook to produce a working model in 3 weeks at a maximum cost to us of $2,500, including materials and $300 extra for conducting DOC approval tests.

About a year later we had a prototype ready for production. We by this time had so many unfilled orders on hand for this long awaited product that we decided to build a run of 45 units to start!

1971. The LWX-25 arrived - 45 of them. These were shipped out to eager customers all over the world. Almost without exception they failed in the field -- mostly from overheating and general instability. They only produced 25 Watts but consumed extraordinary amounts of input power. I calculated the overall efficiency at less than 12%. The small heat-sink would not dissipate it and no air circulation was provided for.

Within a few weeks we had all 45 units back on our hands, burned out, and a lot of irate customers. I could look for no sympathy from our engineering people, but enlisted the able and practical assistance of our Chief Inspector, Tom Gilbert. I promised all customers to have replacement units back in their hands in a matter of a few weeks at most.

We scrapped all 45 transmitters and threw the cabinets, chassis and heat-sinks in the garbage, but salvaged the major boards which we modified and reused.

After procuring a quantity of the largest "off the shelf" heat-sinks on the market we had the metal shop build new chassis, rack mount panels and cabinets, installed three low cost meters to dress them up, and in 1973 the "LWX-100" was born. This was all done in a period of two weeks and our customers were retained. With subsequent changes and improvements the LWX-100A is still with us after nine years. To date 590 have been sold and the annual sales seem to be on the increase. The product shows a good profit margin.

1978. Dick Huisjman undertook a thorough investigation of the LWX-100, pin-pointing its many weaknesses and proposing practical solutions to all of them. The question was, should we try to improve the existing product, or design an entirely new transmitter employing state of the art devices to improve performance and reduce costs.

For reference purposes the proposed new beacon was dubbed the LWX-101. It would offer the following advantages:

1. By using Power Moss-fets in a switching mode for the output stage the overall power efficiency would increase to 35-40% instead of the present 17%.

2. Instead of using two low frequency crystals which are slow delivery and costly items, the transmitter would use the normal A3H mode but use an inexpensive frequency divider and an off-the-shelf type of HF crystal.

3. The A3H mode (one side band and modulator) would comply with ICAO requirements world wide.

4. Also Voice modulation would be possible (a requirement that recently cost us an order for 120 beacons in Alaska).

5. No additional "switch-over" unit would be necessary for dual installation. The necessary circuitry would be contained on every transmitter.

6. All circuitry would be on one board.

7. Physical size of cabinet and heat-sink would be much smaller and lighter than the LWX-100.

8. The small size would facilitate provision for weatherproof, pole mounted units frequently preferred for off-shore rigs and low power approach beacons.

9. The transmitter could be supplied in the 1600-2000 KHz ranges so often requested by some countries.

10. A C-Moss morse code generator costing only $2-$3 would be used in place of the present one at a considerable saving in power consumption. The present diode matrix board could still be used.

11. The estimated cost per unit would be at least $400 less than the LWX-100 which at that time was costing us $1,100.

It was estimated that 10½ months would be required to develop and field test and obtain DOC approval, for a total cost of $35,000, to get to the production stage.

Engineering management recommended against proceeding with the LWX-101 as being too costly and taking too long; and instead recommended that a minimum amount of work be done on the LWX-100 to up-date it. To a certain extent I was influenced in this decision because the LWX-101 development would have required 100% of Ron Spilsbury's time and I felt it more important he be held in reserve for the antenna program.

As a consequence the LWX-100 modification (Project No. 01) was started in April, 1978, with a total budget allowance of $10,800. It was finished 18 months later at a cost of $20,891.82 (207% over budget).

To give full credit, the new LWX-100A costs about $140 less to build than the old beacon and has given very much better performance in the field.

In retrospect, however, I am sure the wrong decision was taken and that we would be dollars ahead if we had done a complete redesign instead of the patch-up. The development cost would have been written off over fewer sales and the added features would have considerably widened our field.

B.C. GOVERNMENT AIRPORTS PROGRAM

In September, 1977, we were made aware of a B.C. Government plan to update a number of secondary airports in the Province and this would involve the installation of NDB equipment. Being a B.C. manufacturer, we were in a preferred position to participate.

We assigned one man (Doug Holmes) to follow up on all aspects of the program. We made the first sale to Powell River Municipality in 1979, and several more were then in the preliminary stages.

At this time, MOT intervened, claiming our equipment did not meet their required specifications if the airport was to be upgraded to "Public" category. Much discussion and many meetings followed. Eventually we thought we had defined their requirements and were prepared to carry out the necessary modifications to the LWX-100A. The Provincial Government agreed to reimburse us for the cost of engineering and modifications just so a B.C. manufacturer could enjoy the business. Before this could be accomplished, however, the MOT officials changed the ground rules several times. Their latest set of requirements were received in November, 1981. It was handed to our Engineering Department for study. January 13, 1982, the B.C. Government wrote and asked us for a report but we had been unable to assign the necessary engineering time for study. It was suggested that we would have a report by February 28, 1982.

In summary the MOT are very biased in favour of our Canadian competitor, Nautel Ltd. and really prefer that our equipment should resemble it in every detail. This makes it easier for their inspection staff who are used to working with Nautel equipment in all Federal Government owned installations.

Recent reports from the field would indicate that other Provinces are getting involved in similar programs to upgrade their secondary airports to "Public" category, and MOT of course will insist on the same requirements as they have in B.C.

Just how large is the market likely to be? Will it pay us to modify and conform? Or, do we forget all about the Canadian market from now on and just sell export?

It seems very doubtful that a beacon modified to MOT specifications would have any special attraction in the export market. In fact it probably would be priced out.

In January, 1979, B.C. had 15% of the total NDB's in Canada. If B.C. is going to upgrade 30 airports, can we assume that other Provinces will follow pro rata?

If so, the total Canadian market might be in the area of 200 dual beacons. If our product was competitive with Nautel, could we expect to get half of this? In addition to the Provinces, the MOT themselves are large customers and currently reported to be planning a purchase of 200 dual units.

In any event it is a big chunk of business and should not be thrown away without at least a good hard look.

1. The specifications should be studied and a modification plan costed.

2. The B.C. Government should be asked if it is still prepared to underwrite all or part of the cost.

3. Our "NDB Market Analysis" of January, 1979, should be updated.

4. All Provincial Governments should be queried as to their plans for updating to Public status.

The four years of negotiation with the B.C. Government and MOT are recorded in the general files and marked "B.C. N.D.B. 1-2-3-4 & 5, but regardless of what transpired and how many times they contradicted themselves, the MOT seem to be firm in their latest demands.

Quite apart from the special MOT requirements, I feel we should seriously reconsider the possibilities of designing a new transmitter along the lines proposed in 1978. I understand that some of our competitors have already adopted the FET switching mode to good effect in their NDB transmitters.

While we are at it, we should also consider an add-on linear module to boost the power to 200 Watts or more to open up the next largest market sector.

Reverting back to our present dilemna in being unable to satisfy the MOT, it now becomes evident that we should have seen this coming and been prepared to work with them instead of against them. In this connection I refer back to Page 2 of the "Observations and Recommendations" of the 1979 NDB Market Analysis, headed (a) Government NDB's.

We obviously never followed the recommendations or the present dilemna would never have developed.

I attach Pages 1 to 5 to this report for reference.

I also recommend that the entire report be studied.

SECTION VI

VHF/FM MARINE MOBILE & HANDY

HISTORY

Back in the early 1950's we imported "COMCO" FM mobile and fixed radios from Florida. Sold to taxis, private cars and fixed stations. Some of the latter included full simultaneous duplex by discreetly spacing the ¼ wave dipoles and inserting wave traps in the receiver.

We eventually entered into a licensing agreement and built the units in the factory. They were, of course, all vacuum tube, large, heavy, clumsy and expensive, but worked reliably. Eventually the competition (G.E. and Motorola) came out with solid state equipment and COMCO did not, and we were forced out of the FM business.

In the early 1970's we imported a number of solid state mobile units from a small company in Denmark. They were good, but costly. We visited their factory in Copenhagen where one girl would build a radio from start to finish! No production line methods.

Then we were contacted by representatives from "AGA" in Sweden. They introduced a beautifully compact, casette mounted little set, the MRU-16. Very good quality and performance, but expensive. They appealed to quality customer -- the kind who otherwise would buy Motorola. We introduced the set to Alberta Government Telephones and other Government Departments. Things went very well and it looked as though we had the Alberta Government market sewed up.

Then AGA went backrupt. The Swedish Government took them over and the Company name changed to SONAB. Prices went up 160% and our sales collapsed -- but not until we had suffered severe losses both in dollars and customer good will, and from a large inventory we had to unload at sacrifice prices.

Our next venture into VHF was when the marine market started to open up. Hugh Dollard, who previously had been our Sales Manager, was running his own business -- Dollard Electronics -- selling imported Japanese made (ICOM) equipment to Hams. He talked them into producing a commercial (marine) model of their 10 Watt mobile, which he introduced to the local market. Hugh had his hands full with the Ham business and arranged for us to take over the importation and sale of the marine set -- 10 Watt 12 channel -- a nice little unit at a good price. We labelled it the FMX-12/10 and sold a good many hundred. Then ICOM produced a large 24 channel marine set and it was a flop -- well made and nice features, but too pricey. We ceased selling the FMX-1210.

It was then that we were approached by Tommy Ishiyama and he introduced us to the Cybernet line of VHF marine. They were already doing big business under the "Hy Gain" and "Unimetrics" labels. We did one of our first in-depth market surveys and projected the magnitude of the new marine market across Canada. By plunging and committing ourselves to 1,000 units, we obtained an astoundingly low cost on our new FMX-12/25. We could just about undersell everybody else -- no one else in Canada imported direct from Japan.

But along came something new -- the 55 channel synthesized marine set and it took off like wildfire and we didn't have one. We then landed a Dealership for the "Key-Com" and we sold a few hundred of those, but they were coming through too many hands -- imported initially to the U.S. and then sold to a distributor in Montreal and then sold to us and then sold to dealers and everyone made $100 on it. We tried to go direct but they wouldn't play -- just as well since the units gave a lot of trouble -- high warranty costs.

Then Tommy got Cybernet to make a special 55 channel synthesized version with our own panel and other features -- the FMX-75. It was an immediate success and our mark-up was good. I think we outsold every other make the first year.

We then introduced the idea of the "Slide Mount" and paid Cybernet for all tooling charges on the understanding that the feature belonged to us exclusively. Our large volume enabled us to absorb the additional cost and advertise the exclusive slide mount feature.

When the DOC opened up new previously unused channels which most sets currently on the market could not accommodate, we had Cybernet come out with the FMX-95S to our specifications. It is interchangeable with the FMX-75S, using the same slide mount. This brought us up to 1981 and the last big year in Canada for marine VHF.

Going back a few years, we found ourselves stuck with a large inventory of FMX-12/25 marine sets -- 600 or 700 -- and very slow moving now that the 55 channel sets were the rage.

We tested the FMX-12/25 to the land mobile specification R.S.S.-119 and managed to squeak it through. All we did was to disable the 1 Watt low power switch on the front panel and labelled it the FMX-12/25L. We were able to unload our entire backlog in less than a year and created an on-going requirement for the FMX-12/25 which was now out of production.

We looked over the Cybernet line of marine sets and found their smallest and cheapest unit, the 12 channel, 25 Watt "Sea Hawk" made originally for Unimetrics. We got Cybernet to dress this up with our panel style and adapt it to a slide mount, and got it approved for land mobile under R.S.S.-119 -- just barely.

The price put us well below anything else on the land mobile market, and we unloaded about 2,000 units.

We received increasing complaints about receiver cross modulation and spurious reception when used in areas of high congestion, and realized we needed a better quality unit, now that the 12/25L and the 1200L had given us a start in the land mobile field.

When in Japan in 1980, Tommy took us to the ANY COMPANY factory and met their engineering group. They had a 12 channel, 25 Watt land mobile designed for Japanese domestic and European taxi-cab use. We imported a sample -- it met

R.S.S.-119 with flying colours, appeared very well built and was very compact. The only thing we had to do was get them to change it around from right-hand drive to left-hand drive. This was easily accomplished by turning it upside down and making a new front panel which we needed anyway. The FMX-1201 was introduced. Unlike Cybernet, the Any Co. are happy to receive small volume orders, 100 at a time, which is a great advantage to us in keeping inventories down.

Once we decide if we are going to stay with the product we should prepare proper literature and advertise it. Also we should make a decision whether or not to convert to using a slide mount. Slide mounting is becoming a Company feature now in both marine and land mobile. How valuable is it as a sales feature? To start with, our salesmen did not like it because it increased the selling price of the product. Recently, however, I believe there has been a change of thinking -- some customers and Dealers say it is the deciding factor in their choice of makes.

This should be looked at very carefully. Any Co. said they would be happy to supply a slide mount and would not require the initial high tooling charges like Cybernet. Unfortunately, a slide mount for the FMX-1201 would not be compatible with the older FMX-1200L because of different dimensions.

On the other hand, Any Co. have a UHF model in the same cabinet as the FMX-1201 and the new mount would serve both sets.

When considering this problem let's make sure, if we can, that when we go into a slide mount it should serve in future for whatever we end up with, in a synthesized version. Or can we see that far down the road?

In the process of adapting the various Japanese products to the Spilsbury line, there have been a few features that we have been quite consistent in requiring, and for very good reasons. As they may affect future decisions, I will mention them here.

1. No push button switches. (Sequencing type). They usually admit water in the marine applications.
   You can't tell at a glance whether they are "ON" or "OFF" -- have to look at a picture diagram.
   Not available in three position.

2. We always insist on "toggle" or "lever" type indicating switches to avoid all shortcomings mentioned above.

3. Sloping panels may look nice on the office desk or for home entertainment type equipment, but don't look very nautical on a boat where a set must be adaptable to table mounting, bulkhead mounting or deckhead mounting without having to take the set apart and change the panel.
   The "square front" at least looks more industrial on a work boat.

4. Frequency selection. Keyboard selection looks very modern but is much slower to use than a straight rotary knob. Also difficult to operate with gloves on.

Even with the FMX-95S you can change from 1 to 99 in a split second -- and you can actually scan a large group of adjacent channels with ease.
Also a simple knob and shaft can be made waterproof with a simple bushing.

5. LED readout. OK providing it is GREEN and has dimmer control. The reds and magenta colours are impossible to read in strong daylight. Some people with "green-red" blindness cannot see them at all.

6. We have tended to stay with black for the cabinet colour to have some family resemblance to our own line of equipment.
Whites and ivory look OK on a yacht but soon look grimy on a work boat. Also black is usually more acceptable in a vehicle.

BASE STATIONS AND REPEATERS

We have recently been reluctant to get involved, feeling that "we don't belong in that league". Personally I tend to disagree and feel that the sooner we get involved the better.

We could do worse than pattern our design after the Western Radio package. They have a very good name in the field.

I have frequently suggested we take two of our good units like the FMX-120l and plug them into a common cabinet and AC power supply. Use the transmitter of one and the receiver of the other. Combine them with the usual Sinclair duplexer and there is our repeater.

Among other things it provides complete redundancy by merely changing positions of the two units. If they are slide mount, all the better. They would even be interchangeable with units in the field. Incidentally, the FMX-120l claims to have "continuous" rating.

I do know that some of our Dealers make up their own repeaters in this way. I am sure we could do as well.

Having our own repeater should surely be influential in the customers's choice of our mobile equipment.

HAND CARRIED VHF/UHF

For some time we had been filling customer orders with the "Wilson" hand held that we purchased through Jack Manon in Seattle. They were good, but deliveries were slow and prices high.

Tommy brought us samples of the "Shinsu" 6 channel, 2.5 Watt units. We asked for a lot of changes and finally sold a few hundred, but we had continual trouble with the factory and their quality control, etc. Nevertheless we sold several hundred as our "FMX-625".

When in Japan we found that Any Company were tooling up to make a better unit. After lengthy discussions we settled on their new design -- 4 channel, 3.5 Watt. We labelled it the FMX-435. Even with this we have had our problems but hopefully the product is now stabilized.

Tommy wanted us to start buying the Any UHF products, and brought samples on several occasions. We decided, however, that we already had enough on our plate and would leave the UHF for some future time.

VHF/UHF REVIEW

A study of our very complete analysis of the Canadian Market tell us that --

1. The Marine VHF honeymoon is over. It will level off and continue with a possible volume of 500 units a year for us, since we don't participate in the low cost pleasure boat field.

2. The Land VHF field is comparatively very large and still expanding. We are among the latest to get involved, but by specializing in market areas that we know, and where we are known, we can expect to get our share. Even if we only succeed in getting 5% of the total it will represent a total sales value several times larger than our current gross revenue.

This I am sure is where the most results can be obtained for the least outlay in time and money. The research has mostly been done.

SECTION VII

18 YEAR ANALYSIS OF DEVELOPMENT AND SALES

Preparing the attached table of SSB shipments brought many things to light. There is nothing like stepping back and taking a long range perspective look at things once in a while. I only wish that I had done this before, but when you are so close to the trees you can't see the forest!

It is said that "history teaches". It is also claimed that we can profit by our mistakes. I only hope that someone else can profit by mine, and then this little history could be a veritable treasure trove!

Look at the chart and imagine where we would be if we had closed down engineering completely from 1972 to 1982 and saved over $1 Million in costs. What would we have lost?

The factory could have been cut back to 6 or 8 people building one SSB product, the SBX-11A, and antennas. Oh yes, and NDB's, they were profitable.

On the other hand, development engineering was not all bad. The SB-60 series certainly paid off, and of course so did the SBX-11.

Some say the answer is "Buy your engineering -- contract it out -- steal it".

I will agree with stealing it. For some unexplained reason we have seldom taken advantage of borrowing designs, but when we did, it paid off.

The only time we have gone out and bought a design, or had someone else do it for us, it has turned out to be a disaster.

Apart from this theorizing, it is interesting to note the steady growth in sales volume in the three years, 1979 to 1981. This can be partially attributed to our stepped up advertising (from 1% to 3%) in the same three years. Also, and more directly to the sharply increased proportion of outside product sales (VHF) of which the advertising was closely related. Also involved in the same time slot was our stepped up dealership program, all a part of the same campaign.

Take another good look and then let's say, "Thank God for the SBX-11".

In case you wish to extend these figures into other areas, or make comparisons with other statistics, I must point out that the numbers on this chart are derived directly from Factory Production Records, which in many cases differ drastically from recorded invoicing and accounting records. Since these discrepancies still exist within the Company, I attach Bergson's memo of May 12, 1980, in the hope that some day the new computer can be taught to talk our language.

Also attached is a table of ratios "Dealer vs Direct Domestic Sales". This information was produced as part of the undertakings in the Croven law suit but can be related to the other chart with considerable meaning.