Approved February 12, 1986
Date

MINUTES OF THE HOUSE COMMITTEE ON COMMUNICATION, COMPUTERS AND TECHNOLOGY.

The meeting was called to order by Representative Jayne Aylward at
Chairperson

3:30 ~~a.m.~~/p.m. on February 10, 1986 in room 522-S of the Capitol.

All members were present except:
Representative Erne
Representative Roper

Committee staff present:
Lynne Holt, Legislative Research Department
Jean Mellinger, Secretary to the Committee

Conferees appearing before the committee:
Arthur Biggs, S & A Telephone Company, Allen, KS
William J. Hilsman, President and Chief Executive Officer, International Mobile Machines Corporation, Philadelphia, PA

Chairman Jayne Aylward opened the meeting and introduced Arthur Biggs.

Arthur Biggs told of the high technology experimentknown as the Wireless Ultraphone Beta Test, which is the world's first and will take place late this summer in Allen, Kansas. The Ultraphone technology is a pioneering venture but he has confidence in it because of the high quality people that are behind it. International Mobile Machines Corporation represents one of the arms of high technology reaching to establish a new concept in telephony and to have a market for Ultraphone. S & A Telephone Company represents one of the arms of rural telephony reaching for cost savings and service improvement through totally digital wireless high technology that can supplement or replace high cost rural telephone cables. They think the Ultraphone will demonstrate this capability in a practical manner in Allen this summer. Digital Ultraphone is one of a kind and should not be confused with cellular mobile phone or any other mobile phone. Users may call through Ultraphone and not know whether the transmission is wire or air; privacy will be approximately as pure as the microwave used in long distance now. Cellular industry forecasters expect cellular to devolve into being like Ultraphone in about six to ten years.

General William J. Hilsman gave some of the background of the company and showed slides of the technology and specific application that begins here in Kansas this summer. (Attachment 1) He told of his experience as Communications Officer for the United States Army and as Commanding General of the Research Laboratories for Communications for the Military. When he left the service and joined IMM, they were looking at cellular and all digital technology. IMM wanted to go to an all-digital system to put in the marketplace. Their original plan was to have a box small enough to fit in a pocket, but they are using a larger box in Allen to be mounted on the inside or outside wall so they can solve a problem of rural America now. With fiber, satellites, and computer switches, the one part of the whole telecommunications structure that hasn't felt the advent of technology is the wire and cable at the end of the telephone system. REA, the government agency involved in the Allen, Kansas, project, is looking at this not only for the S & A Telephone Company but for some 900 other telephone companies that are subscribers. Also, a lot of Bell companies as well as international companies are interested in it. Eventually the same product will go in cars. They are talking about putting this system in large, new developments and new installations. This is a spectrum efficient system. Digital technology offers lower costs, small size, more reliable service, privacy, and security. Subsequent systems will be installed in Glendale, Wyoming; Chinle, Arizona; and Senora, Texas; and many others are interested in it.

Representative Chronister asked the limit on distance between the base station and outlying installations, Gen. Hilsman said they are designing the system for 40 miles now. She asked if they have problems with electrical storms or anything like that and was told there wouldn't be any problem. She asks if anything could disrupt it. Gen.Hilsman said nothing that wouldn't disrupt the microwave system used for long distance.

Representative Sallee questioned as it is a radio signal, if it could be monitored. Gen. Hilsman said the signal will go out digital then they do a separate set of scrambling so

the cost of unscrambling that would be thousands and thousands of dollars. If that isn't good enough, they will put a chip on for about $3 extra that will totally secure the system.

Representative Campbell asked if there was any antenna on the houses. Jim Mullen, who was with Gen. Hilsman, said there was a very small directional antenna on the houses. Representative Campbell asked about the mobile phones and was told that was two years away but the antenna would be somewhat like the cellular antennas of today.

Representative Green asked about the billing on the long distance. Mr. Biggs said it would be identical to what it is now.

Representative Gossen asked what the average customer in Allen, Kansas, would pay for this service. Mr. Biggs said the rates are $5.80 plus $1 access charge for private lines and the rural four-party service which they are targetting with this Ultraphone is $5.30 plus the $1. This new service will be to 20 customers on an experimental basis. The cost will probably be about $10 but that is not a Corporation approved price yet.

Representative Chronister asked where the boxes are built. Gen Hilsman said the first systems will be manufactured by the Mecon Corporation in their San Diego facilities. They are gearing up to use the manufacturing facilities in Puerto Rico. Mecon must meet their cost targets and must develop a second source--give them a specification package that can be given to another manufacturer--so they can have two of them to keep their cost down. The central equipment will be assembled in Philadelphia in their facilities.

Representative Sifers thanked the conferees for coming to Topeka and giving the Committee this information.

Representative Chronister asked when they transmit data if they can transmit four at the same time. Mr. Mullen said at the moment it would take one of the four channels. Representative Chronister asked how fast the speed was. Mr. Mullen said that currently it is 300 to 1200 but because of the digital system they have an outlet point on there that would allow them to handle 9600 per second but the telephone companies aren't ready to deal with that yet.

Chairman Aylward asked if they would be able to hook up a personal computer on the system they are installing at Allen and was told they could.

Representative Friedeman mentioned that he said this was not like cellular and cellular makes use of several towers and asked if this was possible to this technology to allow the system to be extended. Gen Hilsman said they are going to have to think through a strategy that allows them to take what cellular offers and follow with digital approaches to figure out the strategy for migration in the future. Representative Friedeman asked if the band was large enough to support the technology for rural America. Gen. Hilsman said it is enough for from where they are starting. If this catches on like they expect, then there will have to be some kind of allocation in rural America that might be different. Representative Friedeman said Mr. Mullen mentioned that they have a goal of driving the cost down significantly and asked if it will be like we have seen with transistors, microchips, etc. and was told we would see such a reduction with the exception of possibly mobile units.

The meeting adjourned at 4:15 p.m.

The next meeting of the Committee will be at 3:30 p.m. on Tuesday, February 11, 1986.

GUEST LIST

COMMITTEE: H. CC&T DATE: 2/10/86

NAME	ADDRESS	COMPANY/ORGANIZATION
Chip Wheelen	Topeka	SWBell Mobile Systems
Jerry Brantley	Dallas	" " "
Mack James	Topeka	KCC
Karin Maka	Topeka	KCC
Caroline Wilson	Topeka	AT&T
Dorothy J. Biggs	Allen, Ks	[illegible]
JEFF RUSSELL	TOPEKA	UNITED TELEPHONE
Wilbur Leonard	Topeka	Ks. Tel. Assn.
Ed Schaub	Topeka	SWBT

100 [illegible] STREET
[illegible]HIA, PA 19103
215-[illegible]80

INTERNATIONAL
MOBILE
MACHINES
CORPORATION

William J. Hilsman
Lieutenant General-United States Army (Retired)

Current Position - President and Chief Executive Officer
International Mobile Machines Corp.

Background - General Hilsman has had over 31 years experience in communications and computers which includes research and development, production, engineering, developmental and operational testing, training and education, and field deployment. He has had extensive management experience as a program manager of communications and computer systems, as an installation manager of the Army's largest training center, as the manager of the Defense Communications System, the U.S. Defense Department's worldwide telecommunications and computer network, and as the manager of the National Communications System, this nation's government body responsible for government telecommunications.

General Hilsman's first ten years were in operational communications. As a communications officer for a tactical Army communications unit, he installed and operated the first large automated voice and teletype switch used by the Army in the field. For three years, he was in charge of all U.S. Army communications for the U.S. forces in Paris, France, which included five telephone exchanges and the teletype and message centers in the greater Paris area.

General Hilsman's second decade was divided between assignments as commander of operational communications units in Vietnam, Germany and the United States, and assignments in the field of computer science in the Washington, DC area. His operational assignments as a unit commander involved all aspects of telecommunications: wire, radio, radio relay, telephone switches, teletype and data switching and computers. In the field of computer science, he has had one year of direct industry experience with Sylvania Electronics Systems Division, where he served as project manager for the development of an analog to digital conversion system. He headed the U.S. Army Computer Systems Office responsible for the selection of all commercial computers to be used in the Army's scientific and engineering applications areas. His final two year assignment during this period included working with the Chief of Staff of the U.S. Army and as a senior planner to determine how the U.S. Army would design and implement management information systems worldwide.

(Attachment 1)
2/10/86 Hs. CCT

During the last ten years in the Army, General Hilsman was the Army's high technology project manager and Commander of the U.S. Army Communications, Research & Development Command at Fort Monmouth, New Jersey. In this capacity he was directly responsible for developing the future communications and computer systems that would serve the U.S. Army's tactical forces for the next 20 years. He was Commander of the U.S. Army's Signal Center with responsibility in two major areas: one - concept development - how to employ new technology and what type of new technology the Army would need; two - training the 33,500 young people that come into the Army each year to serve in all fields of communications and computers.

In the last three years of his military career he served as the U.S. Defense Department's senior communicator. His responsibilities included the worldwide voice and data network (AUTOVON and AUTODIN), the Defense Communications Satellite Network and the World Wide Military Command and Control Systems (WWMCCS), a system of 32 large computers serving the needs of senior commanders around the world. General Hilsman also chaired the U.S. Military Communications & Electronics Board, the board responsible for joint communication standards, and was the senior U.S. representative to NATO's Military Communications and Electronics Board.

General Hilsman's most important role during this period was as manager of the National Communications System, a U.S. government-wide agency responsible for government telecommunications throughout the nation. His major role was to bring the telecommunications industry and the government together to address the national security and emergency telecommunications needs of the nation.

General Hilsman has a Master's Degree in Electrical Engineering from Northeastern University in Boston, MA, and has served as a professional lecturer at American University in Washington, DC in the fields of Computer Science, Management Information Systems and Design of Real Time Systems.

General Hilsman is married to the former Emily Jean Butler (a national leader in her own regard). Mrs. Hilsman is a past President of the National Military Wives Association, a Washington, DC based organization that works in support of military family issues.

They have four children:

Karen Hilsman Paul, a housewife and mother
CPT Allison Ann Hilsman, a pilot in the U.S. Air Force
Donna J. Hilsman, a Computer Science Specialist
2LT William M. Hilsman, U.S. Army Signal Corps

S & A Telephone will test new technology with goal of providing up-to-date rural service without high cost cable installations.

Telco tries wireless system for local loop

By Art Biggs

My company, S & A Telephone, soon will be installing the world's first wireline-quality wireless local loop system, aimed at upgrading four-party service to single party service in Allen, Kans.

Dreaming about the wireless local loop has been almost a lifetime thing for me. It frequently has seemed that the need for service was where the cables were not.

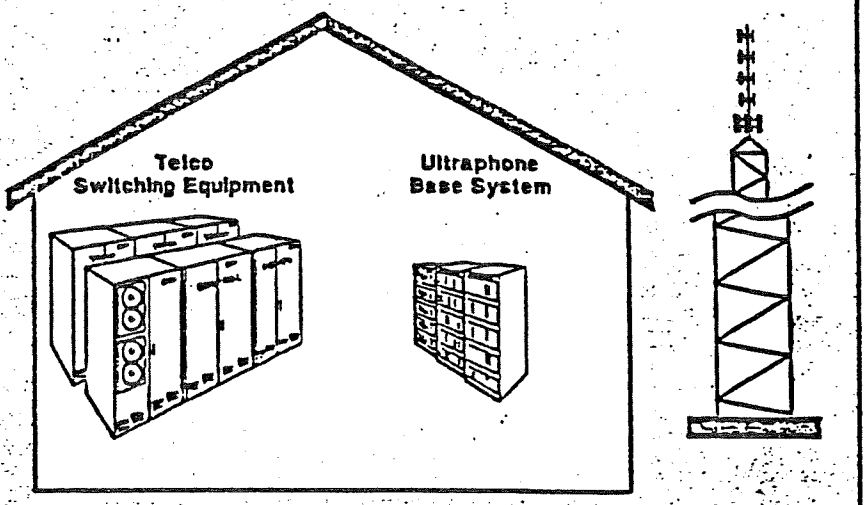
Each time I have had to build a high cost, infeasible wireline extension, each time I have had to dig in rock, each time I have experienced endless and senseless cable damage inflicted by hordes of disoriented and uncaring rural water contractors, and each time I have struggled with the need to install a buried cable on a right-of-way that is already too crowded with other buried utilities, I have wished for wireless telephone.

S & A Telephone Co. is very small. It's a mom-and-pop-type telephone company with only about 770 stations. My dad ran it before me, having acquired it in 1938. I was a preschooler then, and little did I suspect all the postholes I was to dig before I reached adulthood.

We have two exchanges: Scranton, Kans., and Allen, Kans., with central offices separated by approximately 30 miles. Overall density is 3.6 subscribers per mile of cable, and we serve an area of about 170 square miles—215 miles of cables.

Art Biggs is president, S & A Telephone Co., Allen, Kans. This article is adapted from a presentation at the Organization for the Protection & Advancement of Small Telephone Companies (OPASTCO) convention in Montreal.

Typical central office installation



Our plant includes two Automatic Electric step offices and outside cables that are 98% buried. Total investment is approximately $1.5 million ($1900 per customer) and depreciated value is approximately $1 million ($1200/customer).

Approximately 80% of our customers have one-party service and 20% have four-party service. With $1.5 million invested, it will take another $900,000 to bury cables to upgrade the remaining 20%. This would raise our investment to $3200/customer.

The Scranton exchange, with good subscriber density, was upgraded to one-party service in 1977. Our plans to do the same at the Allen exchange were halted by the Kansas Corporation Commission after the four-party subscribers served by the exchange complained that they didn't want rates to increase from $5.75 to $8.75. A second request for the service change in 1979 produced a similar result.

In 1980, we installed a digital microwave for toll service at Allen. Its cost effectiveness and reliability only increased my longing to apply similar principles to the local loop. That opportunity never seemed to be available until I began to read about cellular mobile telephone and its wireline-like quality of service.

About the time that cellular began to gleam in the eyes of telcos nationwide, I was making a third application to the REA for a third try to bury the cables for upgrading the Allen exchange to one-party service.

While awaiting REA's response to the loan application, I also was checking with every cellular supplier in the business to see if there was any practical possibility of using cellular radio as a sort of wireless station carrier. I found that it could be done, that some companies already had it on the drawing

continued on next page

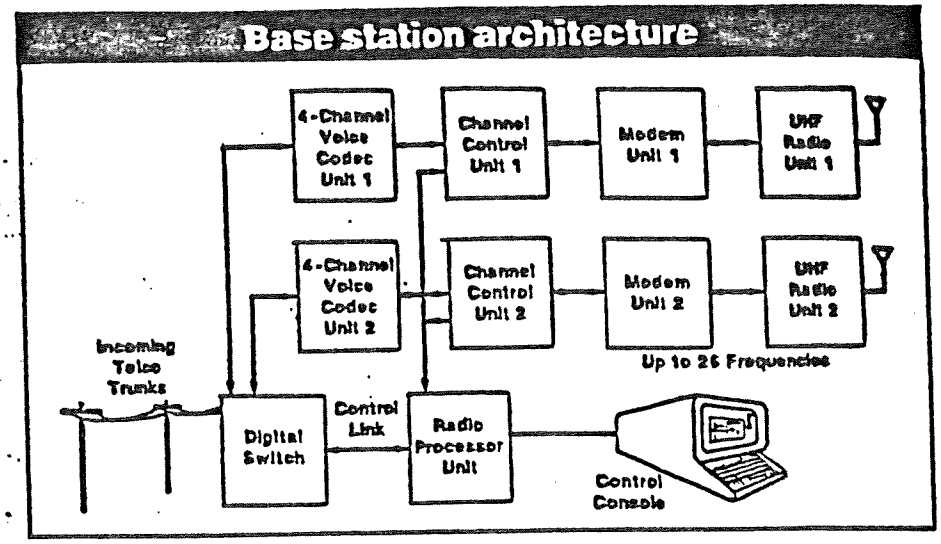
boards and considered it a practical way to go in high cost areas.

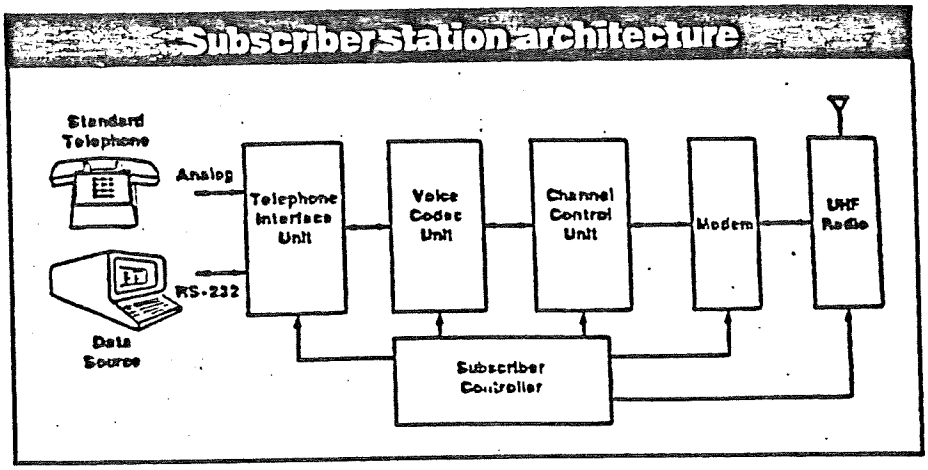
A study of costs showed that the Allen exchange had 49 rural four-party loops and 142 four-party customers. This meant that, if we took the totally wireline approach, we were about to spend an estimated $890,000 for cables alone to pick 93 customers off of existing buried loops for all one-party service. In rough terms, this comes to about $9600 per residence. Since this figure includes in-town burying of all aerial plant at approximately $150,000, a closer estimate appears to be on the order of $8500 per residence. We would retain the buried air core cables and continue to use them in conjunction with the wireless station carrier. By retaining this cable, we would not abandon $130,000 worth of cable.

Our maximum air line distance to the most distant customer is less than 10 miles. Granted, putting the cables in would buy some things that wireless won't, such as a 25% overbuild in pairs. But those pairs aren't worth anything until you use them. Ultimate use of such overbuild is a longshot in many rural areas, particularly ours.

At this stage, it appeared cellular radio, at about $5000/station, looked pretty good. But then, two significant things occurred: the FCC changed the timing of frequency availability, delaying it more than two years; and Claude Buster, chief REA transmissions engineer, tuned his home TV slowly through UHF channels 80 through 83 and found that he could hear cellular conversations with poor but decipherable quality. This fairly well eliminated any likelihood of using cellular for our purposes.

At the same time, however, another technology had been developed. It is called "Ultraphone," and it is soon to be manufactured by International Mobile Machines (IMM), Philadelphia, Pa. Ultraphone is an omnidirectional, time division multiple access modulated, totally digital wireless station carrier system, which, in its initial thrust, will interface step equipment by simply being connected to the outgoing line pairs. It will radiate typically over a 20-mile area, if needed, to a receiver at each customer's location. The designers believe that up to 40 miles radius coverage can be achieved with special provisions.





Ultraphone has these characteristics and possibilities:

- **Total digital operation**—This eliminates noise problems in transmission and eliminates requirements for duplexers. This, in turn, will permit future Ultraphone equipment to be very compact, perhaps cigarette package size in three to five years.
- **Wireless privacy**—The digital aspect of Ultraphone enables it to provide privacy of communications with a quality that rivals digital dish-to-dish microwave used in many toll networks today.
- **One of a kind**—We don't know of any other commercial communications system that transmits digital signals omnidirectionally.
- **Frequency**—Initially, Ultraphone will operate in the 12 channels of UHF IMTS wireline spectrum 454.375 through 454.65 MHz. There is an FCC provision in this spectrum for fixed station use in high cost rural areas. Now that the FCC has removed the fence between other common carriers and wirelines, there is a total of 28 channels available and in most rural areas this spectrum is only slightly used.
- **Spectrum efficiency**—Ultraphone makes four talking paths out of each of today's IMTS 25 KHz channels. Each talking path works in similar fashion to linefinders—when the customer goes off hook, a random talking path is seized.
- **Installation**—At the central office, installation will consist of rolling two refrigerator-sized consoles into available floor space and connecting it to dial tone pairs. A simple antenna will be installed on our existing 100-foot microwave tower, immediately adjacent to the CO and coax will connect the antenna to the Ultraphone system.

The customer installation will consist of: a box, about the size of two loaves of bread; wiring from the box to the outside demarcation point; existing telephone instruments and wiring; a remote, small 120 vac-operated 12 vdc

power s a remote emergency battery; and antenna with coax cable. A backup emergency 12 vdc jack will be included for connection to an automobile cigarette lighter in case of very long power outages. Surge protection also will be included at all Ultraphone exposures and at the residence power entrance.

• Cost—We believe that the first 50 units (both ends) can be installed for less than $300 per station, compared to the cable cost of $8500 per station. Overall, if we buy 100 Ultraphones, the cost will be about $300,000 opposed to about $900,000—for cables to do the same job. A "no frills" central office end only could be installed for about $50,000.

• Mobility—Though it's not our immediate intention, the initial configuration of Ultraphone could be mounted in vehicles and used for mobile phones. It is anticipated that, after very large scale integration produces smaller and cheaper Ultraphones, it could become an awesome competitor to cellular, both in the 450 and 800 MHz bands if the powers that be permit it to happen.

We have received REA permission to perform a field trial of 30 units for a year to determine the practicality of Ultraphone in this environment, and the installations are to take place in the spring of 1986. The initial system will be installed in addition to existing four-party service, which will not be disconnected until Ultraphone has proven itself for several months.

One argument in opposition to Ultraphone is that perhaps it will soon become obsolete as some station carrier that can no longer be maintained and the Vidar digital switch that is no longer in production. I believe I am about to assist in demonstrating that the initial design of Ultraphone is a very good and cost-effective alternative to burying cables where distances greater than four miles are involved. As Ultraphone grows cheaper and improves, its practical distance as a cable alternative is expected to decrease to less than four miles.

If the first generation of Ultraphone does become rapidly obsolete, it may be because a similar better and cheaper replacement system has evolved. The net effect of later Ultraphones could thereby demonstrate that buried cables have grown even more obsolete and, by comparison, less cost effective. ☎