

Cedric Baxter (7/9/23)

I worked at COMSAT from February 1979 until October 2000.

My first job was senior transmission engineer for the Arabsat satellite system.

On that system I worked with many great engineers including Frank Klisch and Denis Curtin.

It was the best and most fulfilling job of my career.

I joined COMSAT and saw the world.

I joined COMSAT in February 1979 as Senior transmission systems engineer.

The group I was assigned to specialized in providing satellite consulting services for overseas countries. It was headed by Ken Manning. I was pleased to have my own office, with a door that closed, and a magnificent view of Regan National airport!

ARABSAT

My first assignment was the Arabsat satellite system, proposed to interconnect a consortium of Arab countries.

Denis Curtin, COMSAT laboratories, Clarksburg Md, had program management responsibility. He interfaced with Dr Ali El Mashat director general of Arabsat, with headquarters in Riyadh, Saudi Arabia.

Frank Klisch had overall system performance responsibility, I worked in his group at L'Enfant Plaza, Washington DC.

T. Kao was my manager; he reported to Frank Klisch.

We produced spacecraft and earth station performance specifications to meet the capacity and coverage requirements of Arabsat.

I worked on specifications for the spacecraft payload, the transponder that receives communications signals from earth stations and retransmits them. This included analysis of signal transmission impairments produced by the transponder.

COMSAT Labs engineers assisted.

Dan DiFonso and Bob Sorbello contributed to the antenna coverage specifications.

Mike Barrett, Albie Williams Dave Weinreich and others assisted with transponder specifications.

COMSAT labs was responsible for the spacecraft bus specifications, electrical power, TT and C, attitude control, propulsion system for station keeping etc.

George Huson, Paul Schrantz, A Berman, Bill Getsinger contributed.

I really appreciated the expertise at COMSAT labs, the best in the world at the time.

I met Bert Edelson, former director of COMSAT labs.

Also Sid Metzger, engineering vice president, both of us had previously worked at RCA and reminisced on our days working on spacecraft communications hardware.

Bert and Sid helped me with calculations regarding spacecraft capacity.

Dr Ali El Mashat would visit Washington from time to time to check on system specifications progress.

We would entertain him with elaborate lunches on the executive eighth floor at L'Enfant Plaza.

I was living in a different world from my earlier engineering days.

I had graduated to the point where I was directly interfacing with the end customer.

Vice Admiral, U.S. Navy, Bill Houser occupied an office next to me for a while, before he joined executives on the eighth floor. I enjoyed talking with him about his days in command of a fleet of aircraft carriers off Vietnam. Bill was very sociable, a number of us enjoyed lunchtime visits to his Navy club in Arlington, Va.

COMSAT had a number of satellite programs at this time, in addition to Intelsat; Comstar-K, Marisat, SBS (Satellite business systems) and STC (Satellite Television Corp). The future looked very bright.

I met some outstanding engineers, Leo Keane, Dan Swearingen, Tom Calvit, Larry Rands, Cal Cotner, Paul Ebert and Jeff Binckes. It was wonderful to exchange ideas with them.

Arabsat spacecraft specifications were finalized and RFPs sent to major satellite manufacturing companies.

Responses were received from five companies:

British aerospace,
Hughes aircraft,
Aerospatial/Ford,
Spar,
and RCA.

Initial evaluation of proposals took place in December 1980 in Washington DC.

It was interesting for me to be on the receiving side of the Spar and RCA proposals. I had previously worked at both companies.

During one of the evaluation meetings we were shaken by the announcement of an assassination attempt on Ronald Reagan.

A final report comparing proposals was completed in March 1981, following company presentations in Washington DC.

Aerospatial/Ford was chosen by Arabsat for contract discussions in Riyadh, Saudi Arabia.

International travel was business class, great.

Meeting was held May 1981, participants included Arabsat, Aerospatial/Ford and COMSAT. Denis Curtin led the COMSAT delegation, my function was to answer questions on payload specifications.

Dr Ali El Mashat chaired the first meeting. He demanded Aerospatial/Ford lower their price before any further discussions could take place.

The meeting was adjourned and we returned to our hotel, a luxurious Marriott hotel.

We cooled our heels for about a week before discussions resumed.

The hotel had a large atrium with internal glass elevators. I spent many evenings watching the elevators go up and down, as I downed a cool soft drink. No alcohol! A group of us rented a car and took an excursion into the desert to visit historical site where present Saudi Kingdom originated.

It was all very Lawrence of Arabia.

I had envisioned the desert to be relatively flat, not so. We saw many large Buttes, up to 200 feet high. Much like the US West.

Also Fish fossils, indicating area had once been under the sea.

Aerospatial/Ford were able to satisfy Dr Ali El Mashat regarding price and discussions resumed. Payload proposed by Aerospatial/Ford was compliant with specifications. My job was done! I returned to Washington DC via London, where I stayed overnight with my Mum in the Carlton Tower hotel.

With the payload specifications confirmed, transmission planning could proceed to finalize channel capacity.

C-band frequency assignments must meet the interference requirements of the ITU, not interfere with other satellite systems or terrestrial microwave networks.

Most transmission was analog. Trunk routes used FDM FM, thin routes used SCPC FM, TV was wide band FM.

Paul Ebert, T Kao, Katie Talberth, Cathy de Peuter, Carrie Devieux, Israel Benoliel and myself all worked on transmission planning.

Aerospatial/Ford was awarded contract for 2 spacecraft in 1981.

I went to Riyadh in August 1982 to present network transmission plans, and again in January 1983 to update for minor transponder noncompliances.

Arabsat 1A was launched February 8, 1985. Arabsat 2A was launched June 17, 1985.

Arabsat service began in 1985 and continues to this day.

SATCOL

In 1980 COMSAT received a contract to study feasibility of a domestic satellite system for Colombia, South America.

Tom Calvit was program leader.

Frank Klisch had overall system design responsibility.

I worked on payload specifications.

A team from Columbia visited Washington DC in 1980, we hosted them on the eighth floor executive conference room.

The object was to meet our opposite numbers and get comfortable with them.

Colombia was well suited for a satellite solution, given the mountains and jungle separating a number of large cities. Connection to smaller communities would also be facilitated.

In November 1980 Tom Calvit lead a team to Bogotá, Columbia to begin initial system design.

I was surprised to see armed guards with AK-47s at the entrance to the Tequendama hotel.

Once in the lobby all was very elegant, with a pianist playing classical music.

We were a large group, and inevitably there was going to be exciting moments in Bogotá.

I remember a pickpocket relieving one of our engineers of his wallet!

Also caution was needed with food and avoiding tap water.

I brushed my teeth with tapwater and didn't feel good for a day or so.

It was concluded a domestic satellite system could be suitable for Colombia, and COMSAT should proceed to develop solutions when we return to Washington DC.

On subsequent trips to Columbia in April and May 1982 we visited a number of possible earth stations sites. Bucaramanga, Barranquilla and Cali.

On one trip I forgot my green card. Fortunately my Mum was able to bring it to L'Enfant Plaza, and a visiting engineer brought it to Bogotá.

Cali was a particularly attractive city, at an altitude of 5000 feet it had an almost perfect climate, 70°F all year.

The highlight, however, was a visit to San Andreas, a small island off the coast of Nicaragua. Our Colombian hosts explained it had once been a haven for English pirates! One evening we had a wonderful meal of barbecued red snapper prepared in a small shack on the beach. Fabulous. After much analysis it was determined the cost of a domestic satellite system for Columbia was much higher than leasing transponder capacity from Intelsat, and the program was cancelled.

LION

Tom Calvit, Frank Klisch, Jack Tennant, Roger Taur and myself went to Beijing, China in September 1984.

We delivered a proposal for a domestic satellite network for China's communications. Satellites would operate in the Ku frequency band and provide high speed, high capacity digital links, between major Chinese cities.

We met with high level Chinese communications ministers.

I spent a lot of time with Chinese engineers, explaining satellite specifications and calculations for system capacity.

Mostly in a huge conference room with pictures of Mao Tse Tung on all four walls. The engineers all spoke very good English and I enjoyed the experience.

Our hosts took us on a day trip to the great Wall of China, a short distance from Beijing. Truly amazing achievement, 13,000 miles built!

We toured the forbidden city in Beijing, very impressive.

Also visited a historic site with underground tombs, relatively close to Beijing.

Our hotel was very modern and situated close to a 10 lane highway leading to Beijing.

Between the hotel and the highway was a very wide sidewalk.

One evening the highway was closed to civilian traffic, to allow for a parade of tanks and missile carriers. It was a practice run to celebrate the Communist revolution of October 1, 1949.

Three of us walked onto the crowded sidewalk and were very surprised to talk English to a group of young Chinese.

Tom's wife Rosemary was with him. She was very helpful arranging return flights for me.

I flew back to Washington DC via Hong Kong and London.

It was an amazing experience for me to actually see Hong Kong. I had read so much about it and now I was actually there! The Union Jack still flew, there still was an empire?

I stayed overnight and visited the famous Peninsula hotel.

Also took a ferry to Hong Kong Island, wonderful views.

I spent some time in London with my Mum, before returning to Washington DC.

GWN

In January 1985 Jack Tennant and I flew to Perth, Western Australia.

We met with representatives of "Golden West Network" (GWN), a TV Network based in Perth.

GWN planned to provide TV service to remote locations in Western Australia, mostly mining towns. We reviewed a satellite solution using leased transponders on

Ausat, a domestic Australian satellite.

The owners of GWN were members of the Royal Perth yacht club. Australia had just won the Americas cup in 1983, and the cup resided in the Royal Perth yacht club.

Being an avid sailor I needed to see the cup! I have a photograph of myself with the cup.

I felt really at home with engineers at GWN, Perth was almost like being in England, except the weather was much better.

I remember a wonderful trip to Bunbury, a town two hours drive south of Perth. Great wines from the Margaret River.

We flew home via Singapore, flight from Perth was first class on Indian Airways. My first experience in first class, very comfortable.

We stayed overnight in Singapore and visited the famous Raffles hotel. Amazing city, very modern.

GENERAL

My notebook shows a lot of other activities, for example:

On March 12, 1984 I attended a DARPA meeting with Bob Davies, Chitre and A. Kaul. Plan was to provide a satellite link to Germany to demonstrate the advantages of packet switched technology.

On April 11, 1984 I attended a STC meeting on how to bill for TV services. Technically quite a challenging task, given TV's Broadcast mode.

On April 20, 1984 I attended a presentation on Mobile Sat at COMSAT labs.

Attendees were:

Joe Campanella, Geof Hyde, Dennis Curtin, John Evans, Leslie Sherman, Bob Davies, Russell Fang, Lou Norman, Lin Lee, Paul Schrantz, Dave Weinreich, Chuck Wolazia and Ashok Kaul from the labs. Bob Lovell and George Knause from NASA.

NASA offered a free launch in exchange for a two year lease. Canada had already filed with the ITU for required frequencies.

This was the beginning of SiriusXM Satellite radio. Joe Campanella joined in the early days, he was in his element, digital transmission.

I was exposed to a rich variety of satellite systems. It was wonderful.

COMSAT was working on some innovative programs:

March 1985, Hi Net Network, A satellite TV distribution network for Holiday Inn hotels in the USA, delivering consumer quality TV.

I was a member of the proposal evaluation team which included:

Bill Mayo, Ed Martin, Dennis Curtin, Larry Westerlund, Ahmed Nagia, Axelrod, David Preiss and Jim Delany.

Irv Goldstein, COMSAT president, was asked at an all hands meeting why he moved a group from L'Enfant Plaza to the COMSAT labs and then one year later moved them back.

Remember this he said, all management decisions are excellent decisions at the time they are made.

COMSAT systems division(CSD) was formed in 1987?

Joel Alper was president. He inherited a number of existing programs including NBC, a satellite TV distribution network for NBC local TV stations, delivering high quality, high availability network TV, and the Hi Net TV network.

His mission was to expand the business. I remember presentations by David Cade explaining how this could be achieved. Through joint ventures and actively pursuing international satellite opportunities. Also becoming a manufacturer of key Earth station components.

In my younger days I had enjoyed working on hardware, but I learnt it is a tough game and stayed away. I continued to focus on systems engineering.

May 1985-1990 Voice of America (VOA) Network

VOA satellite network is planned for distribution of radio channels worldwide.

Programming originates in VOA studios in Washington DC. Work began in May 1985, as transmission systems architect I proposed using a Ku band satellite link from VOA headquarters in Washington DC to Greenville NC. I remember visiting VOA headquarters in Washington DC with John Bleiweiss and others to see if a 3m antenna could be mounted on the roof and not be visible from street level. Fortunately it could.

Ku band link availability is significantly affected by rain attenuation.

There was an in service issue: required link availability was 0.9990, designed link availability was 0.9993. In-service availability initially okay, then fell to 0.9986, not meeting specifications.

I lead an investigation which showed the antenna feed windows were dirty and rain was not beading. Cleaning solved the problem.

Earth station at Greenville NC would uplink programming to Intelsat satellite for worldwide distribution using a broadcast transmission mode(TDM) rather than individual circuits to each overseas station(SCPC). This significantly saved space segment and reduced costs.

However it did increase multiplexing complexity at the Greenville earth station.

I spend a lot of time filing for domestic and international space segment as well as obtaining Intelsat approval for many international Earth stations, which received programming.

We had many meetings with VOA. I worked with many great people: Margarita Johnson, George Lindroth, John Bleiweiss, Pete Brookes and Jim Pockrus.

April 1989 Orlando

Flew to Orlando with David Cade and Stephen Day to present Comstar-K satellite solution for Argentina domestic network. Satellite was in an inclined orbit, 5 years life expectancy, and earth stations needed to be equipped with trackers. Transponder pricing was attractive and would get Argentina started, later on they could transition to other satellites including: Intelsat, PanAmsat or Brazilsat.

Inmarsat AOR TT&C station

COMSAT submitted a proposal for AOR TT&C services in June 1989, using Southbury CES and a dedicated TIW antenna.

I enjoyed working on this proposal.

George Bolling had created an excellent system for proposal preparation, Blue team, Red team etc.

We all knew our place in the team, COMSAT Mobile Corporation (CMC) and CSD.

A team lead by Ted O'Brien and including, Kari Schoonhoven, Bob Smith, Mike Hughes and myself presented proposal to Inmarsat in January 1991 in London.

Inmarsat were initially skeptical, price was very high, earlier estimates had been much lower.

Mike Hughes told Ted O'Brien the previous evening that costs were screwed up.

This did not faze Ted O'Brien, he told Inmarsat pricing would be corrected.

We stayed in the Mayfair Intercontinental hotel, Berkeley Square, and enjoyed some excellent meals in London!

November 1989 KDD

COMSAT Systems Division (CSD) had developed new channel units for installation in Hiroshima CES. A team led by Jay Bashir went to Japan in November 1989.

Members included: John Bleiweiss, Vito Visargio, Gary Kudis, and myself.

We flew ANA from Washington Dulles to Tokyo, non-stop business class. Very luxurious! In Tokyo we met COMSAT representative Buzz Beitchman, who introduced us to Japanese representatives.

Next day we flew to Hiroshima for site evaluation and detailed discussions with CES engineers. In the evening we dined together. I remember eating blowfish(fugu), chef has to be careful to remove all poisonous parts. I survived!

On returning to Washington DC I was tasked with responding to a long list of action items that resulted from design reviews, the last on January 30, 1990. Customer was a stickler for details, correctly. I spend a lot of time evaluating potential anomalous conditions, extremely unlikely occurrences. This was done to assure high service availability.

February 1990 Russia (USSR)

Jim Pockrus and I went to Russia, mission was to visit Inmarsat coast earth stations (CES) in Odessa and Nakhodka (near Vladivostok), and provide information on upgrades to the stations. We landed in Moscow on February 26, with instructions to show up at an Office the next day.

Nobody met us at the airport, we were on our own. Fortunately we had a hotel reservation.

We took a taxi to the Office address. Unfortunately, the taxi driver dropped us off at the wrong address. Apparently, the street numbering system in Moscow can be confusing. By now the taxi had disappeared and we found ourselves wandering around trying to find the correct address.

We sought help from Russian pedestrians, initially with no luck.

For a while the situation appeared hopeless. Eventually, miraculously we arrived at the Office! What a relief.

Our gracious hosts showed us around Moscow. We visited the Kremlin and saw where Napoleon stabled his horses in 1812.

I remember eating in a local restaurant near the Olympic stadium, the meal was truly awful. A watery Borscht and horrible chicken, however, the vodka and red caviar was good!

American fast food restaurants were beginning to show up in Moscow at this time. Jim and I saw a McDonald's restaurant!

We flew Aeroflot to Odessa, as foreigners we boarded first and selected our own seat. Seats folded fully forward's, an unusual configuration!

Odessa is a beautiful city on the Black Sea. It was in serious need of maintenance. However, beneath the grimy buildings one could imagine the glory it had been years earlier. The same was true of Moscow.

With the technical work done at the CES, our hosts showed us around the city. They were very warm and kind to Jim and me. I remember the wonderful Opera house and long Potemkin stairs down to the water.

We flew back to Moscow to book our flights to Vladivostok.

This took some effort, I remember long discussions in the Office. For a while it seemed unlikely we would get tickets, however, I was determined to make the trip.

We flew Aeroflot from Moscow to Vladivostok, a 10 hour flight.

Aircraft was an ilyushin 86 with four large engines at the back.

Flight was very smooth, I remember flying over miles and miles of mountains and lakes. Food was marginal, a small piece of chicken and overcooked veggies.

At Vladivostok we were met by the CES manager, and driven to Nakhodka. It was a two hour drive over very rough roads in a Toyota people mover.

This was a different part of Russia with the Asian influence clearly visible.

Our accommodation was quite primitive, everything was Gerry built, uneven floors and stairs. Same applied to CES.

CES required significant upgrades for new Inmarsat services.

Jim and I were pleased to be able to provide necessary information.

People were very friendly and we enjoyed some excellent meals, a lot of salmon, red caviar and vodka.

All flight times in Russia are given in Moscow time. This led to some confusion about flight times in Vladivostok.

Fortunately we did not have to wait too long for our flight.

I stopped off in London on the way back and Jim flew on to Washington DC.

It was an amazing trip, clearly Russia had a long way to go to catch up with the West!

May 1990 Moscow

Eric Novotny and I flew to Moscow on May 14, 1990.

We were met by Galya Nikalopoillis at the airport.

Mission was to discuss Inmarsat Standard C equipment interface.

We had meetings with V. Bogdanov, Lavkoksky and Kuznetzov about existing Case communications equipment.

One evening V. Bogdanov invited us out for dinner to a Co-op restaurant. These restaurants took only Western currency and provided excellent meals.

Eric and I met lawyers in Pushkin Square on May 17.

From an office window high up we were surprised to see long lines of people in the square below.

It's the new McDonald's we were told (the 1st in Russia, opened 31 January, 1990). Let's see what it tastes like we said. Just like McDonald's back home we assured our Russian friends.

June 1990 Riyadh

Dr Ali Atia sent me to Riyadh to assist with payload specifications for second generation Arabsat satellites.

These would operate in the C and Ku frequency band.

I met my old friend Dr Ali El Mashat, he made sure all specifications were completed before I was allowed to leave Riyadh. It was a pleasure working with Arabsat engineers.

July 1990 Czechoslovakia

I went to Prague with Jim Sutton to explore possibility of using their earth station in a joint venture.

Plan was to access Intelsat 6 satellite at 335° E. and provide connectivity to the West. Earth station was built on a massive raised concrete foundation, 10 feet above the ground. An unusual configuration.

I was told this is how Russia builds earth stations.

We arrived on a very hot day, and my luggage was lost. I was very uncomfortable for a few days!

Prague is a beautiful city, undamaged by WW2.

Wenceslas Square is spectacular, also the Charles bridge over the Danube river built around 1400.

November 1990 Moscow

Eric Novotny and I flew to Moscow on November 16, 1990 to discuss joint-venture possibilities with Comicom.

At this time there were very few telephone channels from Russia to the West.

A large earth station in Moscow was ruled out of the question, due to interference issues.

It was concluded a Teleport outside of Moscow with a microwave link to Moscow was the solution.

Choice was a dedicated Teleport, or piggyback on the existing Bear Lake teleport.

I remember walking downtown Moscow and being surprised to see Joel Alper, President CSD, walking towards me. We compared notes!

December 1990 Moscow

Bob Yamasaki and I went to Moscow on December 7, 1990 for a Teleport team meeting.

Last months meeting with Comicom had determined a Teleport was needed to increase communications from Russia to the rest of the world.

Meetings took place in Moscow and Bear Lake, potential site of Teleport.

Bob and I suggested a number of satellite solutions including Intelsat and Eutelsat and calculated required earth station sizes.

Pricing became a problem, the Russians had no way to compute costs. We suggested a number of different solutions, in the hope of determining the lowest cost one. The Russians said we will just get the job done!

On the way to Bear Lake we were shown the closest place the German army got to Moscow in 1941. We could just see the spires of the Kremlin in the distance.

I remember a high-level meeting in Moscow with Paul Tatum, an American businessman, in attendance. He was managing the new Radison Slavonska hotel in Moscow and needed increased Communications capacity to satisfy his guests. It was a lively meeting, I didn't understand much since they switched between English and Russian.

Bob and I were there to provide technical options.

Later on we visited his hotel to see if an earth station could be located there.

One evening he invited us for dinner in a Co-op restaurant.

He arrived surrounded by a bevy of beautiful blonde women!

He was definitely living the highlife.

So much so that later, on November 3, 1996 he was gunned down and killed outside a Metro station in Moscow.

Bob and I went to the Bolshoi Theatre, saw an internationally famous ballet.

April 1991, Venezuela.

Joint-venture team was proposing a satellite network, with an antenna on top of a skyscraper in Caracas.

I evaluated the situation and came up with a number of solutions.

George Ward was there and I remember some excellent meals, beef was outstanding.

June 1991 Moscow

Roger Cochetti, Herb Holly and myself met with Morviasputnik, V. Bogdanov, Pchelyakov, Pavlov, and Safonov, in Moscow on June 17.

We offered new Inmarsat STD C services for Russian CES's in Odessa and Nakhodka.

July 1991, Costa Rica

I flew to San Jose and was met by a high level military officer. Went to a hotel frequented by Ernest Hemingway, very interesting.

Next day we went to the Intelsat Std A earth station, a short distance out of town.

Spend the day with engineers discussing CSD plans for shared service.

July 1991, Bombay

Arriving Bombay airport for the first time was quite a shock, shanty towns everywhere.

I checked in to the Taj Mahal hotel, downtown Bombay.

Superb hotel, original building from 1905, with ghosts of the British Raj everywhere.

I went to the bar and spoke to some Europeans, apparently engaged in breaking up old ships on a beach nearby.

Gateway to India stood just in front of the hotel.

Next day I went to the India PTT office, to my surprise I was met by photographers: a visitor from COMSAT had arrived.

My 5 minutes of fame!

I was shown around Bombay, Victoria railway station was the highlight, with Queen Victoria Statue still standing. Original business section looked much like older London.

Earth station was in Puna, a 3 1/2 hour railway trip from Victoria station.

Unfortunately this was the monsoon season and the railway track was flooded.

A taxi was hastily arranged with a hamper of food and drink.

Left Bombay at noon, arrived Puna around 6:30 pm, spent the evening with Earth station engineers discussing CSD plans for shared service.

Left Puna at 9 pm that evening arriving Bombay 3:30 am the next day, it had been quite a day!

July 1991, Islamabad

I was met in Karachi by a representative of the Pakistan PTT.

He kindly invited me to visit his home, a large single family house. A dozen males sat on chairs backing the walls of the front room. I was introduced and questioned on my visit, they were all very friendly.

We were invited to the back room where a large table was laden with food, buffet style.

Returning to the front room with a plate of food and a soft drink the conversation continued.

I momentarily observed some women replenishing the buffet table and rapidly exiting to the kitchen.

This was Islam. Flew to Islamabad where I was met by a Major-General Pakistan army. He showed me around including a visit to Rawalpindi, a former British army Garrison town. Visited old barracks, bungalows and Gothic church.

Reviewed CSD plans for shared service with Earth Station engineers.

August 1991 Mexico City

Met Fred Kelly and George Torrico in Mexico city on August 13 to discuss Grupo Sitra, associated with Walmart, Communications requirements.

They planned to link 150 sites in Mexico with data links.

I proposed a number of solutions including Vsats.

CMC

I transferred from CSD to CMC in December 1991, on condition I continue to support the Inmarsat AOR TT&C proposal.

My boss was Ed Jurkiewicz who reported to Dan Swearingen.

My previous spacecraft hardware experience, at RCA Montréal and GE Valley Forge, combined with my systems experience were coming together as one.

I was where I was supposed to be!

My assignment was to assist Ed in monitoring construction of Inmarsat 3 satellites and planning new satellites for handheld service.

Mini-M

Reviewing the Inmarsat 3 specifications I realised new spot beam technology could be used for smaller terminals.

Compressed digital audio channels would be needed, so I visited

DVSI in March 1992, a company in Boston, Massachusetts, and spoke with Jay Hardwick.

Existing Inmarsat digital audio channels used 64 kb/s, he said speeds as low as 7.2 kb/s would provide equivalent quality.

I wrote an internal memo which described a small terminal, called Mini-M, with dimensions of 12 x 9 x 2 inches. Much smaller than any other satellite terminal.

Dan and Ed were very supportive, so I presented Mini-M paper to Actom, (Advisory Committee on Technical and Operational Matters), Inmarsat's technical group in London.

This after extensive evaluation of Mini-M by COMSAT labs.

At this time Dan was Actom chairman, Ed and I would join him in London for meetings which took place three times a year. Each meeting was planned for three days, Tuesday through Thursday.

In the early days we stayed in less expensive hotels, finally we ended up in the Mayfair Intercontinental hotel, Berkeley Square!

Dan and I took advantage of the many theatres in London, on one occasion we saw "She stoops to conquer". Years later Klaus Neumann and I visited Dan, who was suffering from Lou Gehrig's disease and could not talk but could hear. I asked him about that occasion. He nodded in the affirmative. So sad, he was a great engineer and a wonderful human being.

ACTOM meetings were attended by representatives from Inmarsat signatory countries, up to 50 engineers.

Inmarsat approved Mini-M concept and detailed procurement specifications were written.

Chris Leber lead a CMC team to Lillehammer Norway in April 1994 to discuss teaming with Telenor for Mini M service.

Dan Swearingen, Jeffrey Binckes, and myself represented engineering. There was a large business development team.

Bjørn Barstad, William North and many others we knew from ACTOM meetings represented Norway.

I remember wearing a hat with horns, Viking style, as we pranced around in the snow. Telenor were wonderful hosts.

A number of manufacturers including, NEC, AMI and Nera built terminals.

An ACTOM meeting was held in Tokyo in September 1995, Jim Nussbaum and I represented the USA.

At the end of each meeting hosts hold a farewell dinner, and it is customary for each signatory to say something special about their country. Unfortunately Jim left early and I was on my own, what to do? Fortunately Joe Maloney, Inmarsat staff, volunteered to help me, we did a skit on the Star Spangled Banner and Francis Scott Key.

I was Admiral Cockburn scourge of the Chesapeake Bay, appropriate since I enjoy sailing on the Bay.

I made a side trip to NEC where Glen Muth and Michelle Wagner were working on Planet 1, COMSAT's trade name for Mini- M.

Inmarsat 3

Everything depended on the new Inmarsat 3 satellites, scheduled for launch in 1996.

GE Valley Forge was prime contractor, however, the payload was built by Matra Marconi in Portsmouth England.

Interestingly, I met GE buddies, managing the program there.

Payload was designed by an amazing engineer, Dave Greenwood.

Equally impressive were Inmarsat staff monitoring the payload construction, Gene Jilg, Allan Howell and more.

Ed knew everybody from his days with Marecs satellite.

He was very concerned about testing spot beams and had couplers added to the antenna.

This turned out to be very fortunate later on. When a telemetry transmitter failed in orbit it was possible to route telemetry through these couplers to TTC Earth stations and save the satellite.

We made many visits to Portsmouth from 1992 onwards for design reviews. I got to know everybody very well over the next few years, it was almost like going home.

Also many visits to GE Hightstown ,New Jersey with Ed from 1992 onwards, where the spacecraft bus was being built.

I spent six months at this facility in 1969/70, when it was RCA Astro, on loan from RCA Montréal. Designed phase lock loop modulators for use on NOAA spacecraft. Met buddies from the old days!

Ed left in 1995 and joined Hughes aircraft in Los Angeles as a principal engineer. I really enjoyed working with him and missed him greatly.

Inmarsat 3 satellite was launched on April 2, 1996 from Cape Canaveral.

I was there for the launch, with Betty Alewine COMSAT president, Allan Flower, Chris Leber, Tom Collins and a large team from Inmarsat.

Betty asked me if the satellite was going to work with small Mini-M terminals, I assured her it will.

Fortunately, launch was successful and Mini-M service was introduced in 1996. Close to 20,000 terminals were sold in the first year, including COMSAT's Planet 1 terminal. Dan transferred to the Planet 1 group at this time.

C band services

In addition to Inmarsat services which use L band frequencies, we were providing TV and telephony service in the Caribbean using C band frequencies for large cruise ships.

Antennas were larger, 3 m and required precise tracking systems.

We had a dedicated team in Fort Lauderdale and I visited them a number of times.

A global network was planned but never materialised.

Project 21

On December 17, 1991 Olaf Lundberg, Ahmed Ghais, Dennis Mullins, Richard Aspen and Pat McDougall, Inmarsat directorate London, came to Washington DC to present their ideas on satellites for handheld service.

Ed, Dan and I had dinner with them at a Yacht club on the Potomac River.

Project 21 picked up speed when Jai Singh took charge. He encouraged signatories to provide technical help.

Ed, Dan, Albe Williams and myself spent a lot of time in London, 1992-1996.

It was a wonderful time for engineers! We were working on a project that would bring communications to everybody worldwide.

A really useful endeavour.

Three orbital solutions were investigated: Geo stationary, Intermediate circular, and Low earth orbit.

Inmarsat choose an intermediate circular orbit(ICO) solution, providing global connectivity, including the poles, with fewest satellites and acceptable delay.

A separate company called ICO was formed in 1995.

Business development 1996

My new boss was Gerry Nagler, Vice President business development. My function was to provide technical support for the group, with the title "Director Advanced Systems Engineering".

Gerry and I flew to Houston, Texas to visit Haliburton in 1997, we donated a Planet 1 Mini-M terminal. They were impressed with it's small size and global connectivity. Great for field trips in remote areas of the world.

ACTOM

I continued with my ACTOM duties and worked closely with Kim Baumgartner and Larry Paul. Before each ACTOM, we reviewed papers and determined COMSAT position.

I mostly enjoyed ACTOM meetings, Peer review of technical papers was very good with the added value of international input.

One lunchtime I was talking with an Italian engineer who was interested in transistor radios. He showed me a paper written by my friend Rodney Burman. It was about Perdio radio. I explained that I worked on Perdio transistor radios in the 1960's when the company was headquartered a few blocks away. Later on I caught up with Rodney living in a 45 room Castle on the Isle of Wight!

After most meetings Inmarsat arranged light entertainment.

On one occasion we all boarded a red double decker London bus and drove to Eltham Palace in Kent, Henry the eighth's boyhood home. There we enjoyed a lavish Elizabethan banquet/feast in an impressive high ceiling wooden paneled dining room. It was great.

On another occasion, after the conclusion of the meeting, we returned to the conference room to find it rearranged with individual tables, each with four glasses of whisky. We sat down at our own table and listened to the speaker, a Mr Bell from the Bell distillery company in Scotland explain the merits of each one! First a light whisky suitable for breakfast and finally a peaty whisky for the late evening.

The worst was a karaoke evening, I cannot sing. ACTOM Chairman were required to sing. Horrible!

I was elected chairman of ACTOM 63, which was held in London June 9-11, 1998.

Later I presented ACTOM 63 findings to Council 73 in London July 14-17, 1998.

At ACTOM meetings I questioned why Inmarsat was co-locating the new Inmarsat 3 satellites with existing Inmarsat 2 satellites.

This made for simple back up in the event a new Inmarsat 3 satellite failed.

However, it was a waste of resources, if the Inmarsat 2 satellites were relocated to new orbital slots we could reuse their capacity for additional services.

This complicated back up, however Mike Wasse and others at Inmarsat were able to come up with acceptable solutions.

A new global network with Inmarsat 2 satellites was now a possibility.

US Navy

I proposed CMC create a Inmarsat 2 global network to provide lower cost leased services.

New CES's would be required at Perth Western Australia, Fucino Italy, and Southbury Connecticut.

Dee D'Ambrosio understood the possibility of using this network for leased services to the US Navy.

He arranged for me to visit the USS Carl Vinson, a massive aircraft carrier, docked in Alameda Navy Yard, Oakland California, on June 19, 1995, to check for suitable antenna mounting locations. I was shown around the ship. Plenty of room on the transom sponson! As a Navy history buff, it was wonderful to see this magnificent ship.

Tom Collins, President CMC, liked the idea of longer term yearly contract's, at the time most sales were per minute.

I worked closely with Gerry Nagler on the US Navy proposal. He would sit in front of his computer typing away while I provided technical input. It was a wonderful time, we were having fun and doing good work.

At the same time we were working on a proposal for Fugro. They wanted long-term 64 kb/s leases globally.

Our interface was Pat, a wonderful young Irish engineer.

We told him about new Inmarsat 2 network, he realised the cost benefit and offered an earth station in New Zealand that was still crated. This became the Perth earth station.

Vacationing in Melbourne with my daughter in December 1997 I received a call from Gerry. He asked if I could go to Sydney for discussions regarding an Australian service provider. AAPT representative there said they had an earth station in Perth and were interested in adding new services.

Later, in Washington DC Gerry and I spoke with him, it was a snowy evening when we met at his hotel in Bethesda in February 1998. We were much encouraged, AAPT definitely wanted to expand services.

It was still snowing hard when we left the hotel, didn't know whether we were going north or south on 355. We were not drunk!

Ed Slack, Keith Regan, Paul Kolmer Dorsey and I flew to Sydney Australia in late 1998 to select a service provider.

Stayed in a Hyatt hotel adjacent to the Sydney Harbour Bridge.

Had meetings with Optus and AAPT, and selected AAPT based on price, schedule and enthusiasm.

AAPT would assemble the New Zealand antenna in Perth and Keith Regan, COMSAT CES VP, would provide channel units.

Went to Melbourne, to see my daughter, before flying home.

Ed Slack and I flew to Rome for discussions with Italian PTT on using Fucino earth station to access new Inmarsat 2 satellite network.

They were enthusiastic and would dedicate an antenna for that purpose.

Ed and his wife Carole showed me around Rome, he had been there many times before as part of his international relations duties.

We had further discussions in Washington DC to firm up price, schedule and COMSAT supplied equipment.

COMSAT CES at Southbury, Connecticut would provide the final link for global connectivity.

Gerry masterminded all business discussions with the assistance of Ed Slack and Paul Kolmer Dorsey. I listened intently and provided required technical input.

Final destination for US Navy 64 kb/s service was Hawaii.

Leased fibre optic links were required from each CES to Hawaii.

I made a number of trips to San Diego with Tom Collins, Kari Schoonhoven, Bob Baker and others to answer US Navy questions about our proposal. Flew back overnight red eye coach, ouch.

In June 1999 CMC signed a \$110 million contract over five years with the US Navy, for provision of leased 64 kb/s services globally.

Initial service was required in the Pacific later in 1999.

Keith Regan and his engineers along with AAPT did herculean work to have the Perth earth station ready on time.

I worked with Inmarsat to ensure satellites were repositioned on time.

Katie Holeman, President CMC, put me in charge of daily status meetings.

Satellite was in place, earth station was ready, the fibre optic link was late.

We were late. A US Admiral complained to Betty Alewine.

She convened a meeting in her office and chewed us out.

Finally a fibre optic circuit was in place, three days late.

The system worked!

Inmarsat 4th gen satellites

Inmarsat were planning fourth-generation satellites, Hughes aircraft were interested and with Albee Williams and Sohail Sayeh I visited their facilities in El Segundo, Los Angeles a number of times in 1999/2000. Met up with Ed for dinner.

Inmarsat B leasing

My last project was an enhanced Inmarsat B leasing scheme with Nera in Norway. Enjoyed a lot of salmon in Oslo! New more efficient modems would double satellite capacity, halving each 64 kb/s channel cost.

The End

Finally in October 2000 I was called into the HR office.

My job was being terminated, if I signed I would receive one years severance pay with full benefits.

After that my pension would kick in and I would receive health benefits for life.

Sounded like a good deal. I signed immediately.

It was the best and most fulfilling job of my career.

I joined COMSAT and saw the world.