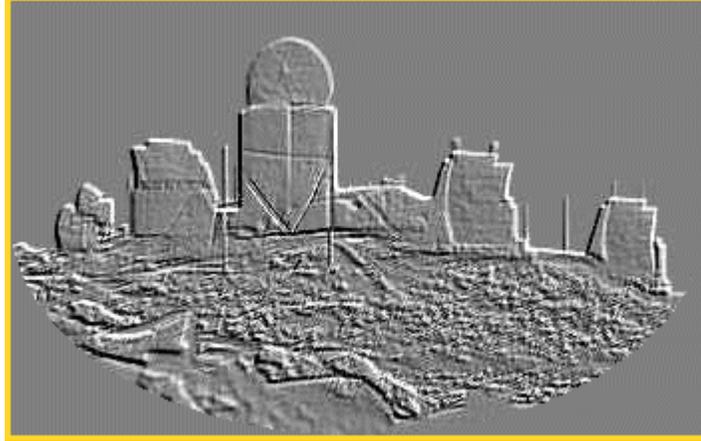


The DEWLINE CHRONICLES

A History by: Lynden T. (Bucky) Harris



● CONSTRUCTION STORY IN BRIEF ●

Any record of events relating to the operations and maintenance of the DEWLine must first recap the construction story. Nowhere has man undertaken so difficult a construction job, Only those that were intimately associated with the construction project can know the extent of the difficulties the construction people overcame, the hardships they endured and the intense effort they applied to build this surveillance system.

Quoted in part, is this story as presented by the Western Electric Corporation, the prime construction contractor, dated 1 May 1958, and presented to Doug Robertson, our Manager of Contracts.

The DEW Line - short for Distant Early Warning Line - is an integrated chain of 63 radar and communication systems stretching 3,000 miles from the northwest coast of Alaska to the eastern shore of Baffin Island opposite Greenland. It is within the Arctic Circle over its entire length and for much of the distance crosses country hitherto unexplored.

The DEW Line grew out of a detailed study made by a group of the nation's scientists in 1952 - the Summer Study Group at the Massachusetts Institute of Technology. The subject of their study was the vulnerability of the US and Canada to air attack, and their recommendation was that a Distant Early Warning line be built across our Arctic border as rapidly as possible,

The Secretary of Defense asked the President of AT&T if the Bell System would undertake the job of building the line. The assignment was accepted, and the responsibility for the overall management of the design and construction of the line was given to Western Electric. Immediately, Western started recruiting a team to do the job from the Bell Telephone Companies, the long lines Department of AT&T, Bell Laboratories and from Western Electric's own divisions. Before the job was completed, men with the necessary

knowledge, skills and experience were drawn from Bell telephone companies in every state in the US. Much of the responsibility was delegated under close supervision to a vast number of subcontractors, suppliers and US military units. It has been estimated that by the time the DEW Line was completed, some 25,000 people had been engaged directly in planning and building it.

Prototypes of several stations were designed and built in Alaska and in a rural section of Illinois in 1952. While few of the original designs for either buildings or equipment were retained, the trial installations did prove that the DEW Line was feasible, and furnished a background of information that led to the final improved designs of all facilities and final plans for manpower, transportation and supply.

A target date for completing the Line and having it in operation was set for 31 July 1957. This provided only two short Arctic summers totalling about six months in which to work under passable conditions. The bulk of the work would have to be completed in the long, dark, cold Arctic winters.

From a standing start in December 1954, many thousands of people with countless skills were recruited, transported to the polar regions, housed, fed and supplied with tools, machines and materials in order to construct physical facilities - buildings, roads, tanks, towers, antennas, airfields and hangars - at some of the most isolated spots in North America.

Military and civilian airlifts, huge sealifts during the short summers, cat trains and barges distributed vast cargoes the length of the Line to build the permanent settlements needed at each site. In all, 460,000 tons of material were moved from the US and Canada to the Arctic by air, land and water.

As the stacks of materials at the station sites mounted, construction went ahead rapidly. Subcontractors with a flair for tackling difficult construction handled the bulk of this work under Western Electric direction. Prodigious quantities of gravel were produced and moved. Concrete was poured in the middle of the Arctic winters, buildings were constructed, electricity, heat and water provided, huge steel antenna towers were erected, airstrips and hangars were built. After the buildings came the installation of radar and communications equipment: then the thorough and time consuming testing of each unit individually and of the system as an integrated whole.

Finally all was ready and on 31 July 1957 - just two years and eight months after the decision to build the DEW Line, was complete and turned over to the Air Force on schedule - a complete, operating radar system across the top of North America with its own dependable communications network.

The DEW Line extends east and west at roughly the 69th parallel. On the average, it is about 200 miles north of the Arctic Circle and 1,400 miles from the North Pole. Its western end is anchored on the northern coast of Alaska. With only a handful widely separated villages (Point Barrow, the largest), it is a remote and desolate section. But in comparison with the area along the DEW Line to the east, it is densely populated and highly developed. Once you leave the Mackenzie River (BAR-C) and head east, you find only an occasional RCMP post

and Hudson's Bay store, plus a few settlements of migrant Eskimos. For all practical purposes, the 2,00 miles between the Mackenzie and Baffin Island are uninhabited.

Construction work needed to build housing, air strips, hangars, antennas and towers was done by subcontractors. In all, over 7,000 bulldozer operators and other tradesmen from the US and Canada worked at breakneck speed under conditions so difficult it is a wonder the job was completed in such a short time. The native Eskimos provided their share of workers on the Line, too. Although baffled at first by modern machines and construction methods, they were quick to catch on. Whether driving dog teams or bulldozers, they proved conscientious and dependable.

Scores of commercial pilots, flying everything from bush planes to four-engine ships, were the backbone of one of the greatest airlift operations in history. Helping them were US Air Force crews of the giant "Globemasters" and "Flying Boxcars". Together they provided the only means of access to many of the stations during the winter months.

The stations are of three types: main stations, auxiliary stations, and intermediate stations. The main stations are the largest. Each one is a complete, self contained community, set in the middle of nowhere. Like any well planned community in the US or Canada, each station has its own electricity, water service, heating facilities, homes, work buildings, recreation areas and roads. But there the similarity ends. The Arctic has dictated what the buildings look like, how they are built and even in what direction they face.

Instead of a group of separate buildings, the typical main station is essentially two long, low buildings connected by an enclosed overhead bridge, forming the letter "H". At one end, set on steel stilts, is the radome - a weather tight dome covering the radar antenna. Nearby are the huge "reflectors" that provide radio communication with the outside world.

Living quarters, recreation facilities, radar and radio equipment and power and heating plants are all within the main buildings. For stations at the western end of the Line, buildings at a deactivated Navy camp in Point Barrow were converted into workshops where prefabricated panels, fully insulated, were put together to form modular building units 28 feet long, 16 feet wide and 10 feet high. These modules were put on sleds and drawn to station sites hundreds of miles away by powerful tractors - a cat train.

Each main station has its own airstrip - as close to the buildings as safety regulations and the terrain permitted. Service buildings, garages, connecting roads, storage tanks, warehouses and perhaps an aircraft hangar complete the community.

Design and development of the specialized radar and radio gear was a joint undertaking of the Lincoln Laboratories of the Massachusetts Institute of Technology and Bell Laboratories. Only a small portion of the equipment was manufactured by the Western Electric Company, the bulk of it being produced by a large group of subcontractors. " Unquote.

At the conclusion of the construction efforts there were unconfirmed rumors that the overall cost for construction of the DEW Line, excluding equipment, transportation and construction of the DEW East Section, exceeded \$750 Million dollars. Construction of the DEW East sector to connect Eastern Canada (DYE-M) to Eastern Greenland (DYE-4) started in 1959 and was completed and turned over to Federal Electric Corporation for O&M in

1961. This completed the connection of this defense system with the Iceland Defense System. Due to the high cost of construction of the Ice Cap Sites in DEW East, no doubt the cost of construction of these 4 sites exceeded the overall cost of the total system in Alaska/Canada.

I had an opportunity to be involved in the last phase of the DEW Line construction program in Alaska. Puget Sound and Drake (PS&D), construction contractor out of Seattle, Washington, was the contractor responsible for construction of the Line from LIZ-A in western Alaska through BAR-C in Western Canada at the mouth of the Mackenzie River.

Interior Airways was the airlift contractor, flying C-46's and DC-3's vertical from and to Fairbanks and the Line. Lateral transportation was accomplished by most anything that would fly. Recognize, the intermediate sites runways were merely 1,000 feet in length, the auxiliary sites 3,000 feet and the main sites at BAR-M and POW-M, 4,000 feet (later extended to 5,000 feet). Stationed at BAR-M was a DC-3, two Cessna 180's, a Norseman and an old C-45 trainer from WWII. Located at POW-M was a similar contingency of aircraft - and both sectors serviced each other as need dictated. Although the primary mode of transportation for personnel, mail and small cargo was via airlift, the primary method of delivering cargo though out the construction phase was sealift and/or cat train. Each winter, after the ice had frozen to about 60 inches, a cat train would be dispatched both east and west from both BAR-M and POW-M to the in between sites delivering, fuel, equipment and construction materials. A cat train would consist of a number of crawler tractors pulling a series of sleds containing the materials to be delivered, plus a bunkhouse, kitchen and fuel (spare parts) for the crew and equipment maintenance.

It was not uncommon for C-124's to land at either BAR-M or POW-M loaded with large cargo destined for the construction program. In the fall of 1956, a C-124 misinterpreted the beacon at POW-1 as POW-M and landed on the 3,000 foot runway at POW-1. It got stopped without damage but had to remain there until about February 1957, when an ice runway about 6-7000 feet could be constructed. The aircraft got off without incident.

You must recognize that working and living conditions for the construction crews were under the most difficult of conditions. The employees lived in Jamesway tents (about 10X12 ft) containing 2 double bunks and housed up to 4 employees. Heat was provided by a gravity fed kerosene heater (made from a 55 gallon oil drum). Fire was the most feared possible incident. Stove "ticklers" were employed around the clock to go from building to building (including the sleeping tents) each hour to "tickle" the stoves - knocking down the suet to prevent explosion/fire. Unless one was an heavy sleeper, he was awoken ever hour by the stove "ticklers". The construction camp had a centralized out house (honey bucket) and shower. Needless to say it was necessary for one to be fully clothed to utilize these facilities.

To off set these uncomfortable conditions was the excellent dinning facilities and of course the outstanding pay. It was not uncommon for an employee to be paid \$3,000. per month via the high-time and over-time rates of pay. One thing that amazes me to this day is how simple, efficient and easy the administration and payroll systems were in those construction days. Today we utilize interactive computers yet must maintain a considerable payroll staff. In early 1957, within the BAR Sector, PS&D had over 250 construction workers finalizing the construction efforts and most all bargaining types (Union) getting paid weekly. Time

included regular time, high time (working off the ground), over time, call outs, hot-time (working on live electrical systems), etc. The payroll and checks were manually constructed, by hand, and each employee paid weekly, by one each John, the Paymaster and one clerk. There was little to no administrative efforts. The Management and Administrative Staff for this 250 man work force consisted of the Superintendent, Personnel Manager, Paymaster, and one clerk.

Some of the PS&D and Interior Airways people involved in this massive effort who are still in trenced in my mind:

Jim Dalton, General Superintendent
Howie Klattie, Superintendent BAR Sector
John Rule, Paymaster
Leo Rafferty, Foreman
Frank "Red" Severence, Cat Train Foreman
Bob Fretwell, Foreman, Power Production
Clarence Fry, Foreman, Heavy Equipment
Jim McGlauflin, Pilot, Owner, Interior Airways
Dottie McGlauflin, Pilot, Owner, Interior Airways
Bob Rice, Pilot, Interior Airways
"Doc" Krause, Pilot, Interior Airways
Charlie Hubbs, Pilot, Interior Airways
Paul Palmer, Pilot, Interior Airways
Niel Bergt, Pilot, Interior Airways
Tony Schultz,, Pilot, Interior Airways

By no means does this listing represent those individuals that contributed the most to the successful completion of this construction project - just a few names that stuck in the mind of this then youngster working with them at that time.

● OPERATIONS AND MAINTENANCE ● CONTRACT PROCUREMENT AND CONTRACT AWARD

On 15 December 1955, the United States Air Force released an Request for Proposal (RFP) for the operations and maintenance of the Distant Early Warning Line. Federal Electric Corporation (FEC) had been formed and activated in 1952, as the service company for their parent Corporation, International Telephone and Telegraph Corporation (ITT). Major General (Retired Army Signal Corps) F. H. Lanahan was appointed President of the new Corporation and Jack Guilfoyle selected as general manager for operations. By 1955 Federal Electric Corporation had already had prior northern experience by installing eighteen TACAN (tactical air navigation) sites in the dead of winter within the interior of Alaska.

Eighteen Corporations expressed an interest and bid for the Operations and Maintenance contract. Federal Electric Corporation was prepared to bid along with the remaining 17 corporations.

Some of the crew that helped put the FEC proposal together included Myron Bakst, Carl Sholz, Bob Walsh, Paul Ketchersid, Jack Gaffney, Carl Pansegrau, Jim Corbet, Fred Altman, Joe Abbott. R. H. Cruzen, Rod Gray and perhaps the most significant contributor was James J. C. Swinney, Jr, plus many others.

In March 1956 (only 4 months after the release of the RFP) The Air Force advised that FEC had won the competition over the other 17 major bidders, subject to negotiation of price and fee.

John Karavish and members of his Air Force procurement staff at Wright Patterson, AFB, Ohio, negotiated the contract on behalf of the US Government.

Ron Perry organized the negotiating team with Carl Pansegrau and Joe Mowder negotiating cost, Warren Morgan and Joe Ceva handling market and Joe Abbott negotiating Personnel, etc. Admiral Cruzen had already committed to become Project Manager, Myron Bakst the Deputy, Jim Sweeny as Project Engineer, Admiral Jess Sowell as Logistics Manager and Jack Webber as Personnel Manager.

Some of the other members of the start up team included Ray Dorn, Sam Bennie, Rod Gray, Herb Hafemaier, Lloyd Dyer, Bill Donaldson, Joe Kelly, Monty Price, George Gyonya, Butch Zumbum, and of course many others.

The first award was a cost plus fixed fee contract and was annually extended for a period of seven (7) years. The average annual cost per year during this seven year period was \$39.1 M with an average annual manning complement of 2,100 personnel. This cost did not include G&A (general and administration) or fee; nor did it included government provided supplies, materials, equipment, transportation, fuels, communications etc.

● ACCEPTANCE AND PHASE IN ●

The acceptance of custodial responsibilities of the DEWline was between 24 October 1956, for the Alaskan POW Sector (Olaf Pederson Sector Supt), and final official dedication on 13 August 1957. On 15 July 1957, the entire DEWLine was declared technically ready and on 31 July 1957, declared operationally and technically complete. The official dedication took place at Point Barrow, Alaska (POW-Main) on 13 August 1957, as Air Force General Stanley Wray turned over the operation to FEC executive Fred M. Farwell in behalf of the Federal Electric Corporation. Other officials participating in the acceptance ceremony were:

Lt General Frank Armstrong - Commander AAC
MG W.M. Morgan - Commander AF Cambridge Research
MG James Briggs - Supt AF Academy
MG H. W. Grant - Dep COS/Operations ADC
MG A. L. Pachynski - Dir of C&E USAF
MG T. C. Darcy - Chief Electronic Defense systems
BG K. Gibson - Commander 11th ADivision
A/Commodore Bradshaw - ADC Hq
MG F H Lanahan (ret) - President FEC
VAdm R. H. Cruzen - VP and Project Mgr - FEC
Others to numerous to list

This massive contract build up of personnel for readiness, including training of personnel, took place within 7 months from date of award. FEC dipped into two of ITT's major companies Kellogg and Farnsworth for a major portion of their on-hands management and technical personnel.

The first cadre of FEC personnel started arriving on the line in October 1956. The technical types assisted the Western Electric installation crews in finalizing and check out of the communications and electronic equipment being installed. Although these technicians (identified as Radicians) had completed their training at the GFE Training Center at Streator, Illinois; this hands-on installation and check out experience enhanced their capabilities far greater than the training they had obtained at Streator and enabled the company to be more proficient and comfortable with the operation at the time of official BOD (beneficial occupancy date).

By early 1957, not only had the radicians arrived for hands-on training, personnel in other crafts and the Management Teams were on board learning the operation in preparation for official take over in July 1957.

Due to the lack of real time communications between the line, support base and the Project Headquarters, it was considered necessary to have a full management staff at each sector headquarters. Although this management approach would indicate considerable layering of supervision, it was not fully rectified until 1978.

Too, with early take over of the program, it could be stated with accuracy, the project was staffed military experience top heavy. Listed is some of the military retired top brass originally assigned to the project: Admiral Cruzen, General Willis, Admiral Sowell, Navy Captain Montye Price, Colonel Bo Riggs, General Seleen, Admiral Tedder and Admiral FBC Martin - ten (10) O6 or better and more.

● SCOPE ●

The original Line extended from LIZ-A on the northwest corner of Alaska to DYE-M on the east coast of Baffin Island in Canada overlooking the Davis Strait. The DEWline in total consisted of seven (7) sector main stations, 23 auxiliary stations, 29 intermediate stations and three rearward communications stations: AGE-X in Anchorage, Alaska, NEL-X at Ft Nelson, British Columbia, Canada, and RES-X on the east coast of Canada. Rearward support facilities were located at Fairbanks, Alaska (Ladd AFB) the Western Region, and Mont Joli, Quebec, Canada - the Eastern Region with staging offices at Edmonton and Montreal. In addition, an important activity was the Training Center located at Streator, Illinois.

Originally, the contractor (FEC) had a Project Headquarters in Lodi, New Jersey. In July 1957, FEC relocated the Project Headquarters to Paramus, New Jersey. Concurrent with the contract award for the 1972-75 contract, the government dictated that the contractors Project Headquarters be located within a 5 mile radius of the Headquarters, Air Defense Command, the operating command for the DEWLine, Colorado Springs, Colorado. Likewise, concurrent with the 1988 through 1992 contract, the government dictated that the contractors Project Headquarters be located within a 5 mile radius of the Headquarters, TAC, Langley AFB, Virginia, the Operating Command of the DEWLine at that time.

From 1957-1963, the original operating command was ADC (NORAD) with contract procurement functions being handled by AMC/AFLC. Initially, the monitoring and surveillance organization, the 4601st Support Group (DEW), Air Defense Command, was located at the Rome Air Development Center, Griffiss Air Force Base, Rome, New York. Concurrent with the relocation of the Contractors Project Headquarters to Paramus, New Jersey, the 4601st Support Group collocated within the Contractors Project Headquarters. The DEWSystems Office - the OPR for the DEWline - moved concurrent with the contractor to both Colorado Springs, Colorado, and Langley AFB, Virginia, located within government provided facilities on base at those locations.

● GOVERNMENT RESPONSIBILITIES ●

The Government was responsible for the use of the equipment and made all operational decisions relative to the data derived from the system or systems operations. The Commander, was designated as the Quality Assurance Representative for the purpose of monitoring the contractor's performance and providing monthly Certificate of Service.

The government provided supplies and facilities available within the Government assets on a non-reimbursable basis which were required in the performance of the contract. The supplies and facilities consist of any and all items of existing Government property made available to the contractor at the various DEW System locations.

The government provided the necessary funding for the contract including costs for labor, and associated fees and costs; materials, equipment, facilities, transportation, fuels, etc required in the performance of the contract. Logistics and transportation support to contractor personnel performing, supervising, and administering services specified. Communications service was provided to the contractor personnel on an as available basis

and subject to theater or command regulations and directivities which may be imposed from time to time. It is of interest to note that little to no changes in the government responsibilities clause of the contract occurred during the life of the DEWLine.

● CONTRACTOR RESPONSIBILITIES ●

The contractor provided the necessary management, supervision, operations and any other efforts necessary to fulfill the requirement of the contract. The scope of the required services included the functional areas of administration, general management, operations, CEM maintenance, Civil Engineering, logistics and services, security, safety and personnel support. The contractor was responsible for manning, operating and maintaining the radar/communication systems, related electronic equipment, real property facilities and support areas to include other agencies and projects, 24 hours a day, seven days a week, in accordance with established DEW Orders, DEWLine Instructions, directive publications and other criteria as may be dictated.

● CONTRACT MANAGEMENT ●

Based upon the terms of the contract the civilian contractor had the management responsibility for the O&M of the line. The basic contract specifications and statements of work outlined these responsibilities. The government, through their Inspection and Quality Assurance Evaluation Program, insured compliance and through the Contracting Officer provided "Certificate of Services". This monthly administrative certificate was the vehicle permitting the contractor to receive payment for services rendered. The governments' method of remedy for the contractors' failure to perform, was denial of payment "withholding of funds" pending restitution or resolution under the terms of the Federal Acquisition Regulation dispute clause. The Air Force contracting officer and the contractors Manager of Contracts were the only officials that could officially direct, accept or respond to official tasks, contract modifications, or official correspondence. The government did not interfere with the contractors' day to day management responsibilities nor did the contractor interfere with or deny government personnel access to government facilities, equipment or records in the exercise of their official inspection duties.

The original 1957-1963 contract was procured by AFLC/AMC at Wright Patterson Air Force Base, Dayton, Ohio. The 1964-1969 contract was procured by AFLC, Sacramento, California. For the record of procuring commands for the remaining contracts, the civilian contractor, and responsible operating command, refer to the chart below (DEWLine Commands and Contractors). The following Government Procurement officials were the designated Contracting Officers in administering the DEWLine contracts:

Mr. John Karavish
Mr. Emmet J. McCarthy
Colonel John Leming
Colonel James Middleton
Captain John Balch
Mr. Herman Niblett
Mr. Terry Kulp
Mr. Harry Stanley
Ms. Linda Chartier

Numerous Contract Administrators and Contract Negotiators (too numerous to document) were assigned to assist the Contracting Officer in administering the contract.

Counterpart to the Governments' Contracting Officers were the Contractors Manager, of Contracts. During the life of the DEWLine, only 6 Manager of Contracts were assigned:

Mr. Joseph Mowder
Mr. William Briggs
Mr. Frank "Bud" Fitch
Mr. Gerry Sipe
Mr. Paul Deery
Mr. Douglas Robertson (Doug was the Manager on numerous occasions for extended periods of time)

No attempt is being made to identify all Air Force or civilian contractor management personnel. However, listed below is both all DEW System Commanders, along with their counterparts, DEWLine Project Managers:

● US AIR FORCE DEW SYSTEM COMMANDERS ●

Colonel Andrew J. Reynolds
Colonel Richard E. Bowman
Colonel Robert O. Gruetzmacher
Colonel William Menzie
Colonel J. R. Mathews
Colonel William Davis
Colonel Joe Weems
Colonel Charles Neel
Colonel Travis O. Jones
Colonel Gordon Breault

● DEWLINE PROJECT MANAGERS ●

Admiral (ret) Richard H. Cruzen
General (ret) J. S. Willis
Admiral (ret) FBC Martin
Colonel (ret) Donald W. Roberts
From 1972 through 1982, the Management of both the DEW Line and BMEWS projects were consolidated with a single Project Headquarters, Project Manager, and Project Functional Managers. During this period of time the Project Managers were:

Ronald Tracey - RCA
Rod Gray
Larry Howland
Gerry Beth

In 1983, the contracts were again split into separate Project Headquarters and Project Managers, and the DEWLine Project Managers from then to completion of the project were:

Dennis K. Kurpius
Darrell Leed

Lynden T. Harris
Wyvil Sartain

Considering going through 11 different procurements and nearly 40 years of service, only 12 changes in the contractors' top management positions were made.

● DEWLINE COMMANDS AND CONTRACTORS ●

| FY PERIOD | OPERATING COMMAND | PROCURING COMMAND | CONTRACTOR |
|-----------|-------------------|-------------------|------------|
| 1957-1963 | ADC | AFLC | ITT/FEC |
| 1964-1966 | ADC | AFLC | ITT/FEC |
| 1967-1969 | ADC | AFLC | ITT/ASI |
| 1970-1972 | ADC | ADC | ITT/ASI |
| 1973-1975 | ADC | ADC | RCA |
| 1976-1978 | ADCOM | ADCOM | ITT/FSI |
| 1979-1982 | TAC | SAC | ITT/FSI |
| 1983-1987 | TAC | SPACECOM | ITT/FSI |
| 1987-1992 | TAC | SPACECOM | ITT/FSI. |

Starting with the 1970 through 1972 contract period, ADC provided contract administration and continued through 1978. In 1978, the management responsibility for the DEW Line was transferred from ADC to the Tactical Air Command (TAC) with procurement responsibility (and contract administration) transferred to the Strategic Air Command (SAC). The procurement and contract administration responsibilities were transferred from SAC to ADC/Space Command in 1983. Although Space Command procured the contract for the period 1987 - 1992, the Tactical Air Command assumed these responsibilities at the post award period and continued to administer the contract to completion.

● COST AND MANPOWER ●

The original contract provided for 2,100 contractor employees at an annual labor cost of \$39.1 million and the last contract was for 738 employees at an annual labor cost of \$60.1 million. Labor cost for the life of the contract was \$1,342.5 billion or an average cost of \$38,357 million per year. This does not include G&A, profit, OR reimbursable cost. To add these cost, it is estimated cost of the life of the DEWLine would be \$2,708.2 billion, or \$57,056. million per contract year. It is significant to note that these costs do not include other cost factors such as fuel, transportation, communications, and registered equipment. The Defense Logistics Agency, Cameron Station, Virginia, funded, budgeted, and procured all DEWLine fuels. The Military Air Lift Command budgeted and funded and procured all contract airlift. Headquarters Air Force, budgeted, funded and provided all SAM flights. Air Force Communications System, Scott AFB, Illinois, funded and provided military circuits/satellite links, and autovon, and AMC Warner Robins AF Depot, Georgia, funded, budgeted and provided vehicles and related heavy equipment.

Just imagine the total cost of fuels and transportation. We know how much fuel we consumed and could perhaps estimate the total cost with an average cost per gallon. Have seen diesel fuel from .12 per gallon about 1960 to .85 per gallon in the late 1970's. However, transportation cost in Greenland alone could run into the hundreds of millions as everything in and out of the Ice Cap sites had to be moved via MAC SAAM C130 missions.

● COST AND MANNING RECAP ●

| CONTRACT PERIOD | TYPE CONTRACT | BASIC MANNING | CONTRACT VALUE/YR |
|-----------------|---------------|---------------|-------------------|
| 1957-1963 | CPFF | 2100 | \$39.1M |
| 1964-1966 | CPIF | 1600 | \$28.3M |
| 1967-1969 | FPIF | 1200 | \$24.6M |
| 1970-1972 | FFP | 1080 | \$24.6M |
| 1973-1975 | FFP | 1090 | \$25.4M |
| 1976-1978 | FFP | 895 | \$29.0M |
| 1979-1982 | FFP | 855 | \$47.2M |
| 1983-1987 | FFP | 748 | \$46.2M |
| 1988-1992 | FFP | 739 | \$60.1M. |

Note: RCA won and operated the line between 1973 and 1975. All other contracts were performed by ITT/FEC or an ITT Company ASI or FSI. The FSI proposal for the 1972 through 1975 could not be located to determine why/how ITT lost this contract.

● CONTRACT MODIFICATIONS ●

An official contract modification was necessary to add funds (or withhold) to the contract, direct the contractor to perform additional (or reduction) of work, assign work requests, construction projects (rehab/modifications) when such efforts were within scope of the contract but beyond the scope contracted for by both parties. Thousands of contract modifications were generated during the life of the DEWLine. For example, during the five year contract period between 1 October 1982 and 30 September 1987, over 900 contract modifications had been issued.

Through out this document are explanations that should track and support the major changes to the manning. For example, in 1963 the 28 intermediate (I) sites were deactivated. However, in 1961, DEWEAST (Greenland) stations were activated within the same contract period. This would have had somewhat of an offset effect during the 1957-1963 contract period.

● MINIMUM MANNING CLAUSE ●

This special contract clause MERITS SPECIAL RECOGNITION. In 1974, Captain John Balch, Contracting Officer and the ADC Procurement staff, conceived and included in the 1975-1978 procurement contract, the minimum manning clause. Since this procurement technique represents the most significant change in Contract Administration through out the life of the DEWLine it is given special attention as part of the DEWLine History. Although numerous changes to the original clause has been made over the years, the original concept developed by Captain Balch and staff remained through out the life of the DEWLine.

First lets explain (not define) a Firm Fixed Price Contract: A contract based upon identification of all tasks required, manpower requirements, rates of pay and total dollar

cost including benefits, profit and other direct costs. The key to a good fixed price contract is the Statement of Work to permit the Contracting Officer to have a vehicle or method of measuring the contractors performance to a specific task or level of performance regardless of the cost to the contractor. If the contractor manages the system well and performs satisfactory, it has an opportunity to increase its profit by under running cost - which will equate to contractor profit. However, a poor managed system with poor performance can create an over run which is a direct loss to the contractor. To further illustrate the FFP type contract: A contractor bids and prices a manning compliment of 1200 man years of effort but can provide satisfactory performance with only 1100 man years of effort. The contractor than would reduce its cost by 100 man years (pure profit). Conversely, if he bid and priced 1200 man years per year but in order to provide satisfactory service it took 1300 man years of effort, the contractor would have a direct loss of 100 man years of cost - quite significant. This would force the contractor to shirk on performance and not perform to contract standards in order to prevent major corporate losses. This could represent poor performance and unhappy relationship for both the Government as well as the Contractor.

Now a Firm Fixed Price Contract with a Minimum Manning Clause. The Government, through the Statement of Work, identifies the positions on the contract that must be filled at times specified by the Government or the Contractor would not only not be paid, but if the position went vacant, the contractor must reimburse the Government. This gives the impression that the Government has the best of both worlds and could not lose - WHICH IS TRUE. If the contractor failed to man the system as proposed, the funds not expended by the contractor had o be returned to the Government. Therefore, key to success with this system is the Contractors ability to manage the work force so that all positions were filled at all times as specified by the minimum manning clause. A most difficult task since so many difficult conditions influenced the contractors ability to man the system which could not be forecast: aircraft delays, bad weather, resignations, illness, vacations, etc. Recognize that the workers had up to 85 days of vacation yearly yet most positions had to be filled each shift on each day depending upon the position. For a manning requirement of about 750 positions, the contractor must have employed at all times over 1,000 employees in order to meet its contract commitment.

Not until computers and data transmission became available was the system perfected. Data transmission enable the contractor to develop the monthly manning report from the payroll data base. During the initial implementation of the system (1975-76 time frame) hundred of man-hours were expended by both the contractor and the Air Force Procurement staff in meetings in an effort to insure that both the parties were in complete and concrete agreement as to the rules to apply and the application of the system.

● ECONOMIC PRICE ADJUSTMENT - SERVICE CONTRACT ACT ●

The U.S Department of labor issued annual Wage Determinations and each contract contained the clause entitled "Fair labor Standards Act And Service Contract Act - Price Adjustment." The Government recognized the adjustments that were made necessary by the contractor having to comply with the Wage Determinations Act, and made funding adjustment accordingly.

● STATEMENT OF WORK ●

Key to the successful contracts for both the Government and the Contractor was a specific Statement of Work. The last Statement of Work issued in 1988-1992 had over 30 years of experience and the refinement over these years produced a document that details the tasks to be performed without ambiguity or guess work by either party. During the past 10 years not a single conflict between the Government and Contractor occurred over the interpretation of the Statement of Work. This reflects favorably upon the Governments' attention to detail and certainly reduced to zero conflicts over interpretation of the SOW. As you enter the 4700 DSO Office on Langley Air Force base the first sign you see is "WHAT DOES THE STATEMENT OF WORK SAY" - it says it all.

● ADMINISTRATION ●

Management and administration of the contracts was based upon compliance with various specifications, documents, regulations and publications. The contract specifications took precedence over all other documents with order of precedence being the Contract, the Statement of Work, the Contractors Technical Proposal, and Directive Documents. All publications and documents were divided into two categories; directive and guidance. A directive publication was one in which compliance by the contractor was mandatory. A guidance publication was to provide performance of that specific activities mission by a method employed by the contractor satisfactory to the Government.

At the Project Headquarters was a master library of all directives, regulations, technical orders and publications applicable to the entire line with a duplicate library set aside as a reference bidders library. This library contained over 6,200 publications. These were DO's (DEWLine Orders - 55), AFR's (Air Force Regulations - 300), T.O.'s (Technical Orders - 3,900) and DLI's (DEWline Instructions - 2,040).

Probably the most massive undertaking FEC incurred between contract award and 1958, was the development or finalization of these directives. These publications provide information and advise to the contractor in performing a particular job or carrying out an operation in a manner compatible with Air Force procedures. As changes were directed by the Contracting Officer/Government to the directive documents, the Contractor was allowed 30 days to assess the impact, if any, and advise the government of such impact before compliance was mandatory. Any change that had a monetary impact was negotiated between the contractor and the government prior to the directive becoming effective.

Each DEWLine activity maintained a library of all directives and publications necessary for the specified instructions of what, when, where and how to perform a specific task; from "how to grade the runway" to how to "test and treat the potable water" and/or how to align the receiver for the AN/FRC39 radio with parts breakdown listings, or how to repair a Maytag washing machine with parts listing identifying parts required. There was a written procedure that outline how to repair, calibrate, align, etc, every job task on the DEWLine. As new pieces of equipment were received from Government sources an Air Force Technical Order may be provided. If the equipment was from a commercial source, or an Air Force Technical Order was not provided, the contractor had to develop, publish and distribute the necessary instructions. These instructions, although modified to keep abreast of equipment changes and state of the art techniques, remained basically the same through out the life of the DEWLine.

In order to document performance, and related activities, over 2,000 different forms were in use. These forms documented occurrences from time reporting, trouble tickets to supply documents. Any form that could be obtained from Government sources were utilized in lieu of developing a specific commercial or contractor designed form. Forms control was managed and supported by the PHQ Administrative staff with stockage of supplies at each of the supply support activities.

The Contractor provided distribution and mail support for all administrative matters from the PHQ to and from all DEWLine activities. Since the PHQ was basically colocated with the DSO Air Force support Group, the Contractor provided distribution support (mail) for the Dew System Office.

Each Statement of Work specified by CDRL/DID, data and reports required to be submitted by the contractor. each data item description specified the data to be provided, method of submission, date(s) of submission, copies to be provided and the office of submission. During the 1988-1992 contract, over 80 recurring and specific reports were required. Periods of submission being as occurrence, daily, weekly, monthly, or quarterly

● A VISIT TO THE BAR SECTOR 1957/58 ●

In July 1957, at the time of contract O&M take over by Federal Electric Corporation there apparently was no major concerns or panic. The management staff and most of the technical staff had already been on board anywhere from 3 to 8 months. Everyone seemed comfortable with their responsibilities and carried out their duties without undue pressure. The original management staff was as follows:

LaVerne Newell, Sector Superintendent
Arnold Smith, Sector Chief of Communications and Electronics
William Bachman, Sector Chief of B&OP
Bruce Davis, Sector Chief of Logistics
Doctor Bob Becker, Medical Doctor
Doctor Howie O'Gorman, Dentist
Reverend Paul Maurer, Chaplin

It is believed that Vern Newell was the most versatile manager I ever worked with. He could and would do anything and everything from flying airplanes to operating heavy equipment; from repairing electronics or refrigeration units to antenna rigging. I had the opportunity to visit with Vern at his retirement home in Florida in 1990, and at that time he remained sharp and vinegar coated as ever. However, I was advised late in 1991 that he passed on that fall.

Lets visit with some of the BAR-M/BAR Sector personnel working in that sector during the 1957/58 time period:

Karl Lockhart, BAR-M Station Supervisor
Jack Eagen, Lead Radician
John McKeon, Chief Clerk/Medic
Bucky Harris, TransSpec/Airport Manager
Joe Esposito, Air Cond/Refer

John Rosco, Plumbing
Chuck Munshaw, Electrical
Ted Jacobson, Carpentry
Bob Fretwell, Power Plant Supvr
Bill Rounds, Light Duty Shop
Clarence Fry, Heavy Duty Shop
Bill Funi, Supply
Gordon Peqanuet, Sec Station Supv
Art Brown, Sec Station Supv
Jessie Covington, Sec Station Supv
Dick Humphreys, Sec Station Supv
Yancey James, DLM Supv
Lou Bolderzar, DLM Supv
John Bolderzar, Supply
Sherwood Mansfield, Chef
Abner Mansfield, Cook
Jim Hickman, Supply
Max Bausell, Supply
Wayne Weeks, Supply,
Jay DePoy, Supply
Jay Broyles, Supply
Herman Rexford, Equip Opr (Native)
Issac Akoochik, Equip Opr (Native)
Neal Allen, House Mouse (Native)
Danny Gordon, Laborer Airport (Native)
Bob Rice, Pilot
Neal Bergt, Pilot
Juels Thibadeau, Pilot
Paul Palmer, Pilot
Frank Gregory, Pilot
Tony Shultz. Pilot

The BAR sector encompassed sites from POW-C west of Barter Island, Alaska, through BAR-C in Western Canada at the mouth of the MacKenzie River - a total of 9 Stations. Support was based upon the Sector concept, with all stations supported from the Sector Headquarters at BAR-M. Manning at the I sites (intermediate sites) consisted of a 3 man workforce. The Station Chief (electronics technician), a Chef (housekeeper) and a mechanic. The Station Chief maintained and operated all of the electronics 24 hours per day 7 days per week. The Chef cooked, baked, and kept house. The mechanic hauled water, sewer; maintained the runway and roads, ran the power plant and did general equipment and building maintenance. Any maintenance required beyond the station capabilities was satisfied by a Sector roving team out of the BAR Sector Headquarters. Manning at the aux sites (auxiliary) sites consisted of approximately 25 Management, Technical, Mechanical and Administrative employees. At the Main Station, which included the Sector Headquarters, manning was perhaps 225-250 employees; especially during the summer months when the sealift arrived and outside work projects were underway.

The average age of personnel assigned to the DEWLine at this time was probably around 30 years old. Vern Newell, John Roscoe, and Joe Esposito were considered "old men" yet it is

doubtful they were yet 40 years of age. Most of the early employees were recent Korean conflict veterans and no doubt in their mid - to late twenties. - and in excellent health.

The early days were extremely busy times. There was no such thing as a time clock or even a time card. You worked until the job was done - be it nights, Saturdays and Sundays. The work schedule was based upon 6 nine hour days, or 54 hours per week. All technical, mechanical, and administrative personnel were paid identical salaries of \$1,000.00 per month. Supervisors were paid \$1,200.00 per month and the Superintendent paid \$1,500.00. (It is understood in the Canadian Sectors, the salaries were some what less). Each employee signed an 18 month contract. Upon completion of the 18 month tour, a \$1,200.00 bonus was paid. This was excellent compensation considering the economy and cost of living in 1957. Since board, room and transportation was provided as a part of the contract benefits, employees had very little expense other than the small amount of necessities required for proper grooming. A two week unpaid leave was provided after 9 months of on site duty. Transportation was provided the employee to and from his home of record for vacation and at the completion of his contract.

Meals were and have always been outstanding. Anyone that has ever been on the DEWLine will vouch for that. Meals were served 3 times per day plus a mid-night meal for shift workers consisting of what was left over from the dinner meal, or, the baker that brought up the mid-night meal would serve a breakfast, or, one could fix its own cold sandwich. Only two main meals were served on Sunday - a brunch from 10am until noon, and a dinner meal normally prime rib or T-bone steak. All of the dry and staple goods were receive from the DLA out of Philadelphia via the annual sealift. Meats, produce and vegetables were received from the Commissary at Ladd AFB, in Fairbanks, via air. Sometime in around 1958, a cost cutting measure was undertaken and a sub-contract was awarded Crawley-McCraken, a Canadian company to provide the culinary support duties - that did not pan out and the contract was terminated in less than a year. Also, at about the same time another cost cutting measure was undertaken to eliminate the chef at the Intermediate stations and provide frozen "TV" dinners for those employees. Needless to say that did not go over well either.

Mail was by far the most important item of concern. This was the only method of communicating with the outside world. Weather problems and conditions plus the lack of air navigational aids prevented on schedule arrivals of the mail and resupply planes at the outlying sites. Let a station go without a mail plane 10 days or so, which was not uncommon, and you certainly had a group of disgruntled and angry employees. Recognize that the only method of communicating off of the line other than via mail was by teletype.

One could telephone across the line, say for example from Barter Island to Point Barrow (BAR to POW) but you would have to dial through 4 switching centers (PBX) to get there. One would hve to first dial POW-3 PBX, wait for a dial tone, then dial POW-2 PBX, wait for a dial tone, and dial POW-1 PBX, wait for a dial tone, and then dial POW-M PBX, wait for a dial tone and then dial the local number desired. Nine times out of ten you would get knocked off the circuit before completed and have to start all over again. All of the telephone numbers at all of the auxiliary and main stations were identical - with exception that at the main stations, home of the sector headquarters, additional telephone numbers were required that added numerous other numbers. Telephone number "21" would get the console at all stations, "22" the station supervisor, etc. An excellent scheme.

Each station had a small necessity store (PX/BX) that was stocked with necessities such as tobacco products, tooth paste/brushes, towels, toilet soap, washing power, candy, soda pop and etc. Each store was opened, either during the lunch hour, or, one hour after work. One of the on station employees accepted the job of store operator and was paid a small fee for maintaining stocks, records and performing the sales. A committee consisting of the station supervisor and 2 other employees performed a monthly audit to insure that the books and money was in order and correct. The necessity store operation was segregated from the station government functions and sale prices were established to insure no profits/loss was generated.

Initially, each employee was permitted to purchase from the necessity store one six pack of beer per week. It wasn't long until ingenuity set in and a group of men built a bar, created a recreational committee, purchased the station allocation of beer from the necessity store, and sold the beer over the bar without restriction. This was a realistic method since some folks did not drink and since all BAR Sector personnel, including transients, arriving and or departing the line would have to first come to BAR-M for onward travels, permitted transients to have a beer with their friends while on station., There were times when we ran out of beer allocated for the month but no panic set in and the employees merely awaited the allocation to be made. There was no hard liquor permitted on the line (until around 1963). However, I must admit that a lot of shoe boxes arrived via the resupply plane from Fairbanks. I assume that those in charge merely looked the other way. Be assured that booze was not a problem or abused in the early days.

Planning for the recreational needs for the DEWLine employees was initially considered very inadequate. This perhaps was due to the initial large staff of personnel assigned, plus the influx of personnel to built added warehouses, garages, maintenance shops, housing and other work projects; billeting and recreational facilities were sorely missing. Until additional facilities could be constructed, perhaps as many as 50 per cent of the employees had to reside in temporary billeting facilities left over from site construction - Quonset Huts.

Each station was provisioned a major library with hundreds of books; weekly newspapers, and monthly magazines. All kinds of games were provided - cards, chess, checkers, ping pong, pool tables, fishing equipment and some outside supplies such as footballs, softballs, etc. Bridge, pinochle, poker and checkers were major games played after dinner and on Sunday afternoon. Poker was normally "penny" ante and the games never got out of hand or created problems. Due to inadequate recreational space, the dinning room was utilized, after clean up each night to permit employees to havean area to play cards and read.

Each station was provided a tape recorder and tapes of music; a 35mm movie projector and 3 movies per week. Again, due to overpopulation, the dinning facility had to be used as a theater. In order to go a year without seeing the same movie twice, Hollywood would have to produce 156 new movies each year - an impossibility. We just ran the same movies over and over about ever couple of months.