IEEE Milestone: 40th Anniversary of TAT-1

First transatlantic telephone cable system

On Sunday, September 24 an IEEE Milestone commemorating the first transatlantic cable was dedicated at the site of a former cable station of the system in Clarenville, Newfoundland. There are approximately 60 of these milestone sites in the world honouring significant achievements in the history of electrical and computer engineering, of Six Milestones are in Canada. In recognition of its pivotal role in the development of worldwide communications, half of the Canadian sites are in Newfoundland. The first successful transatlantic telegraph cable, in 1866, is commemorated by a Milestone at Heart's Content. There is a Milestone at Signal Hill in St. John's honouring the reception of the first wireless signal across the Atlantic by Marconi in 1901. The latest Milestone recognises Clarenville as the eastern terminal of the first transatlantic telephone cable, TAT-1 which entered service on September 26, 1956.

The TAT-1 inaugurated the modern era of global communications. Before TAT-1, voice was carried on unreliable radio channels and text messaging was carried on submarine telegraph cables (the technology of the previous 90 years), which was reliable, but slow and expensive. TAT-1 operated with exemplary reliability until 1978, when advances in technology made it obsolete. An article giving details of TAT-1, as well a history of submarine telegraph and telephone cable can be found in the spring 2006 edition of the IEEE Canadian Review.

by Jeremiah F. Hayes
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The dedication ceremony, blessed with fine weather, drew about 100 spectators. The roster of speakers began with greetings and best wishes for the political leaders of the community: Mayor Fred Best of Clarenville, Ross Wiseman, MHA, Trinity North and Bill Matthews, MP, Random-Burin-St.George. Dr. Camilla O'Shea from the Clarenville Heritage Society eloquently explained the role of Clarenville in the transatlantic project. The Heritage Society and the town of Clarenville were instrumental in establishing the Milestone. The role of the people of Newfoundland in telecommunications was celebrated by Dr. Wallace Read, a resident of Cornerbrook and the former president of the IEEE. Dr Ferial El-Hawary, President Elect of Region 7 conveyed the best wishes of IEEE Canada. Dr. Jerry Hayes, a former worker on TAT-1, called for a moment of silence remembering the men and women who worked for global telecommunications. The plaque was unveiled by Lloyd Currie and Kathleen Chafe. Ms. Chafe, Chair of the Newfoundland-Labrador Section, did wonderful work as chair of the committee that arranged the ceremony. Gerard Dunphy, IEEE Canada External Relations Groups Chair and a past Chair of the Newfoundland-Labrador Section, was the Master of ceremonies.

A proud and happy moment at the dedication of the TAT-1 IEEE Milestone plaque, September 24, 2006

From left to right: Gerard Dunphy, IEEE Canada External Relations Groups Chair; Dr. Wally Read, IEEE Canada Past President; Kathleen Chafe, Chair of Newfoundland-Labrador Section, IEEE Canada; Dr. Camilla O'Shea, Clarenville Heritage Society; Ferial El-Hawary, President-Elect of IEEE Canada; Ross Wiseman, MHA - Trinity North; Bill Mathews, MP - Random-Burin-St. George; Dr. Jerry Hayes, IEEE Life Fellow, author/historian; His Worship Fred Best, Mayor of Clarenville. *Photo courtesy of Kirk Squires.*

One of two displays flanking the monument, this artwork gives visitors to the site an excellent overview of the need for TAT-1, the technical challenges in designing the system, and the story of its installation. At bottom left of the board the routing of incoming calls is described. After reaching Clarenville, calls were trenched across the Isthmus to Terrenceville, Fortune Bay, then connected into a submarine cable to Sydney Mines, Nova Scotia. From Sydney Mines, the calls were routed by micowave radio facilities to the United States and Canada. Our thanks to Clarenville Heritage Society for permission to reproduce this display. *Artwork by Brad Reid.*

CLARENVILLE REMEMBERS FIRST TRANSATLANTIC TELEPHONE CABLE

WIRELESS TELEPHONE service between North America and Europe began in 1927 but it was costly and unreliable because of atmospheric disturbances affecting the signals. Although transatlantic telegraph cables had been in service since the mid 1860s, the design of a transatlantic telephone cable had been an engineering challenge for many years. It was not until after World War Two that improvements in insulation, vacuum tube reliability and coaxial cable technology were at the stage where a transatlantic telephone cable could be considered.

In the early 1950s, a consortium of the UK General Post office, AT&T and Canadian Overseas Telecommunication Corporation, decided the technology had advanced to a point where a transatlantic telephone cable was viable. They decided Oban, Scotland and Clarenville, Newfoundland would be the eastern and western terminals. Clarenville was chosen to avoid congestion with the transatlantic telegraph cables landed in Trinity Bay. Two cables were planned, one for each direction of transmission.

AT&T designed the transatlantic cable, incorporating "flexible" repeaters in its design, meaning the repeaters were wound with the cable into the cable ship's holds. These repeaters amplified the telephone signals every 37 miles, requiring 51 repeaters in each cable. The first telephone link, named TAT-1, provided 36 transatlantic circuits.

The Monarch was the largest cable ship afloat, approximately 480 feet long, displacing 8962 tons. Its four cable tanks could hold 1500 nautical miles of deep-sea coaxial cable. The Monarch left Clarenville on July 22 1955, under Captain J. P. F. Betson, and headed toward Scotland. In a public ceremony, a bottle of water from Heart's Content harbour (the site of the first successful transatlantic telegraph cable) was ceremoniously broken on the new cable.

The cable was laid in three sections: the first 200 miles east of Clarenville in shallow water, using a heavy underwater cable to minimize the risk of damage from icebergs and fishing gear. The next 1250 miles was across the Atlantic cable arrived at Port Lathaich, south of Oban on 26 September, 1956, only a few days after riding out the remnants of Hurricane Ione. The following summer, on 14 August, 1956, the Monarch installed the east to west transmission cable at Clarenville.

The Clarenville cable extended underwater up Northwest Arm to a point near Adeytown and trenched across the isthmus to Terrenceville, Fortune Bay, where it connected into a submarine cable to Sydney Mines, Nova Scotia. The Cabot Strait section consisted of a single cable using fourteen two-way "rigid" repeaters. Sixty two-way circuits were available on this system: 36 for transatlantic telephone traffic and 24 for circuits between Newfoundland and the rest of Canada.

At Sydney Mines, the telephone lines were routed by microwave radio facilities to the United States and Canada.

The transatlantic cable cost approximately 120 million pounds. Twenty-nine circuits were used for telephone traffic between London and New York, six between London and Montreal and one was shared between the United States and Canada to provide 28 telegraph circuits.

The inaugural telephone call took place on September 25, 1956 between the British Postmaster General, the chairman of AT&T and the Canadian Minister of Transport. In the first day of public service, there were 588 calls from London to the United States and 119 to Canada. During its first year, the telephone cable carried twice the calls made by radiotelephone.

Clarenville was also the site of the second transatlantic telephone cable in 1959. This cable was owned by AT&T, the French Ministry of Posts, Telegraphs and Telephones, and the German Federal Ministry of Posts and Telecommunications. This link was named TAT-2 and gave North America a direct telephone cable to the European continent at Penmarch, France.

A direct telephone connection to North America had already been established, with seven of TAT-1's circuits assigned to European cities.

TAT-2 was longer than TAT-1 and required 57 repeaters. The cables entered Smith Sound and came ashore just north of Snook's Harbour, on Random Island, where they were trenched overland, north of Elliott's Cove and extended by submarine cable to Clarenville. TAT-2 used this route rather than TAT-1's Northwest Arm route to minimize the risk of grappling the wrong cable during maintenance.

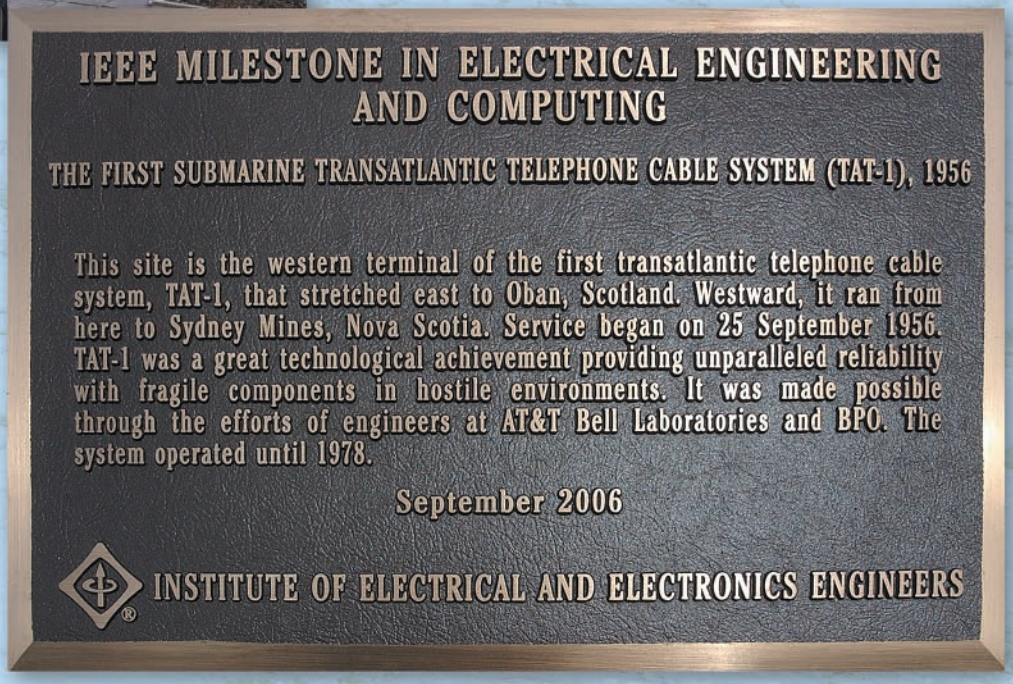
On June 14, 1959, while the vessel Ocean Layer was placing the TAT-2 cable from France, it caught fire and became a total loss. The cable was cut almost 950 miles from shore and the Ocean Layer was towed away for scrap. The Monarch completed laying the cable, assisted by the Ampere on the French end and the John W. Mackay on the North American side. A second Terrenceville to Sydney Mines cable was also installed as part of this system.

The Clarenville station was managed by Eastern Telegraph and Telephone, a subsidiary of AT&T. The station was originally powered by four diesel generators, which were used for back-up when commercial power from the Lockston power station became available in 1957. The large array of batteries was housed in the basement and the communications equipment was located on the first floor. Although all telephone conversations between North America and Europe passed through the building, the design of the transatlantic system required long distance calls between Clarenville and Europe to be routed via Montreal.

A new transatlantic telephone cable came ashore at Hampden, White Bay in 1961. The cable called CANTAT-1 was operated by the COTC. In 1974, CANTAT-2 was installed between Widemouth England and Beaver Harbour, Nova Scotia. This co-axial facility carried 1840 voice circuits and made the earlier cables obsolete. As a result TAT-1 was retired in 1978, followed by TAT-2 in 1982, resulting in the permanent closure of the Clarenville station.

Clarenville Heritage Society

Kathleen Chafe, Chair of Newfoundland-Labrador Section, addresses the gathering. To the right of Kathleen is the Clarenville Cable Station (also depicted in artwork above). Built during the Cold War as part of the TAT system, it was considered a military target because it linked North America with Europe. The station had walls two feet thick to withstand enemy bombs. Ironically, it was new advancements in communications technology made during World War II that made the dream of a transatlantic telephone cable achievable. *Photo courtesy of Kirk Squires.*



Of the approximately 60 IEEE Milestone Sites worldwide, six are in Canada. In addition to TAT-1, they honour Hydro Québec's 735 kV Transmission System; Manitoba Hydro's Nelson River HVDC transmission system; DeCew Falls Hydro Electric Plant in St. Catherines, ON; Transatlantic Telegraph Cable of 1866, NA terminus at Heart's Content, NFLD; and, First Transatlantic Radio Signals, 1901, Signal Hill, Nfld.