Airborne Geophysics Evolution 1945-2006
USGS aeromag plane-1945
U.S. Navy aircraft used for 1945/1946 aeromagnetic survey of the National Petroleum Reserve, Alaska
Jay Demming, Bell Aircraft pilot, awaits Hans Lundberg before taking off to survey the area around Amos, Quebec, with the electromagnetic equipment in the nose of this helicopter.
Hans Lundberg
First heliMag system
1947
Hans & Sten Lundberg with heliMag, 1947
USGS towed bird mag system-1947
USGS mag crew-
Mimi Hill (far right)
Lundberg heliMag system-1948
Lundberg-Conoco
AEM system 1949

1st Successful Airborne EM!
W.A. Robinson (McPhar), Stanley Davidson - geologist, H.A. Harvey (McPhar), J.A. Syme - pilot geologist.
Miner in the sky

The old prospector and his burro are gone. Scientific tools help the modern prospector do a better, faster job. He can even detect iron ore from the sky using a magnetometer suspended from a glider.

Kennecott prospectors have uncovered new sources of tin from Australia in Canada, in Africa, in South America and here at home, it is an important part of our job to maintain a constant search for new sources of metals. Along with our exploration goes a program of continuous research to increase the recovery of metal from the ore of already established mines. By extending the life of these mines — as well as by discovering new ones, Kennecott helps to insure a constant flow of the metals so vital to the nation.
ABEM 2 Aircraft AEM System, 1955
NUCOM, 1955

1st Helicopter towed boom
Spartan Rio Mullard Otter EM on Beaver, 1956
Rio Tinto – Mullard, on Beaver, 1956 Champion – Don Wagg
RioCanex
Spartan Air Services was hired in 1957 to fly the Cape Smith Belt for a group of companies. First survey of its kind.
Newmont/Varian/Aero on Sikorsky, 1957
Newmont/Varian/Aero on Sikorsky, 1957
(Dick Butler)
GEORGE SANDER LTD.
174 Douglas Ave. Oakville, Ontario Phone VI 4-6345

Helicopter Borne Electromagnetic Instrument of GEORGE SANDER LTD.

1958

Sander HEM advert-1958
INCO’s Vic Kanerva, 1959
Austin’s Mark Nieminen, 1959
INCO McPhar, on ANSON late 1950s
Barringer INPUT on Canso, 1959
McPhar AFMAG, on ANSON 1959
Texas Gulf-Varian on Hiller 12E, 1959
Texas Gulf-Varian on Hiller 12E, 1959
Canadian Aero Nose Tail EM on Canso, 1960
INCO Anson, 1962
Ed Morrison
AFMAG, 1962
Adastra-Hunting on DC-3, Australia 1963
Geophysical Engineering EM System on Beaver, 1964
Barringer Mk-5 INPUT Systems Trials on Canso, 1965
Barringer INPUT System on USGS Covair-1965
Vaino Ronka & ‘natural ‘wind tunnel’-1965

Vaino Ronka
Early attempt to study flying characteristics by flying a "bird" off 1/2 ton.
1st Input European Demonstration in France, 1965

Reg Cruickshank, Francis Kivinen
Barringer staff with CGG in France for INPUT trials, 1965
Neil Dick, Reg Cruickshank, for European Demonstration in Ireland 1965
INCO ANSON System, 1966
McPhar AFMAG on Cessna, 1967
Reg Revard, Reg Watts, Ed Morrison, & Bill Edwards
Ed Morrison, 1967
McPhar AFMAG on Cessna, 1967
Peer Norgaard, Michel Jacquemin, Art Rattew

Don Wagg, Michel Utard, Rolf Pedersen, Ian Fraser, Jacques Leridon

Ivo Tyl, anon, Roman Wasylechko, Wolf Tsaikowsky, Peter Gunn, Aime Brazeau

Horst Stoltz

Mike Reford
First heliTEM developed at NGRI (USSR)-1967

Vertical axis Transmitter loop on Ka-26 helicopter with receiver coils in a towed bird.
McPhar F400, 1968
Ed Morrison

McPhar, 1969
Top: Frank Wakida, Tony Anselmo
Top: Bill Robinson, Hans Thurro
Geoterrex INPUT on CANSO, 1969
McPhar F400 on Cessna, 1969
Twin Otter INCO EM system on Twin Otter, 1969
McPhar KEM (VLF) System
1969
McPhar machine shop, late 1960s
McPhar electronic shop, 1970

1 - Frank Tomiola, 2 - Bill Robinson, 3 – Mike McGee
McPhar mag
Kalgoorlie
on Beaver, 1970
QUESTOR INPUT on Skyvan, 1971
McPhar 400, Australia on Turbo Beaver, 1972
McPhar – H400, Malawi (Africa) on Bell 204, 1972
Bob Middleton, David A. Whiteman & Duncan McNeill
AN-2 – USSR Ministry of Geology, 1973
Finland Wing-Tip EM System on DC-3, 1973
Questor INPUT on Trislander, 1973
McPhar H400 on Hughes 500, 1973
MTA Turkey F400 on DC-3, 1974
George Sander-1975
Data plotting, 1970’s
Data plotting, 1975

Mike Holroyd

Litsa Parker

George Teed

Data plotting, 1975
IGGE, China – Y-5 single freq., 1975
Sander HEM on Bell-1975
QUADREM System on DC-3, 1976
QUADREM – Northway Services on DC-3, 1976
QUADREM on DC-3, 1976
Kenting/Scintrex TRIDEM on Canso 1977
Geosurvey TRIDEM on Twin Otter, 1977
Questor HelilINPUT on Bell 205, 1982
Kenting SWEEPEM on Canso, 1984
Kenting Earth Sciences, 1984

T. A. Jones  J. E. Macartney  R. W. Stemp  J. E. Walker  D. Fitzsimmons
E. C. Anderson  D. Freer  H. Gansen  D. Mallet  J. Weatherseed
Geotech NORDA System, 1984
Geotech Ice Thickness System, 1985
Kenting Gradiometer, 1985
GEOTEM CASA, 1985
Questor Helium Magnetic Gradiometer, 1986
Questor
Trislander
System, 1986
Questor Skyvan Time Domain System, 1986
Aerogeophysica 3-Freq. EM System, 1987
Hudson’s Bay System, 1987
Hudson’s Bay System, 1987
Geotech Hummingbird, 1988
Figure 1. Airborne EM Configuration (standard SIROTEM horizontal loop/RVR)
Geo Instruments EM 2 Freq., 1989
Terraquest 1st Horizontal Gradiometer, 1990
Geotech Hummingbird 2 Freq. System, 1990
SPECTREM, 1991
SPECTREM, 1991
GTK Twin Otter, 1995
Aerodat HELITEM System, 1996
Dighem operating in Scandinavia-1995
Dighem doing fly-by of CN Tower-1995
Geotech Hawk, 1999
Roger Henderson
Ed Morrison

Major HeliTEM developers
late 1990s-early 2000s

Graham Boyd

Wally Boyko

Bernie Kremer
THEM loop,
early 2000s

Bernie Kremer
THEM in-flight, early 2000s
Geotech AFMAG (later called ZTEM), 2001
Geotech “Dream Catcher”
Time Domain System, 2002
Geotech VTEM II, 2004
SkyTEM System

- time range: 20 μs - 10 ms
- Tx-size: 10 x10 meter, max current 50 amps, square wave
- adapted Tx pattern, highest Tx-moment: 20,000 amp.m²
- adapted Rx receiver system providing no bias or leveling corrections.
- Tx-Rx altitude: 10 - 30 meter
- total weight: 280 kg (all included)
- operates “stand-alone”, no operator or equipment in helicopter
- fast on-site mobilization