



WORLD IN PERIL

**The Origin, Mission & Scientific Findings
of the 46th/72nd Reconnaissance Squadron**



By Ken White

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The first photograph of
the entire earth from space.
Courtesy of Maynard White

Oil painting of the "Kee Bird"
by Ken White

Chapter 27

Terrestrial Magnetism Studies

After the first flight by the 46th over the polar sea, the navigators on the flight recommended that an intensive study be made of the magnetic compass and its reliability in this area. One of the navigators in the flight made preparations to carry out such a study, but abandoned the project as flights did not go over enough area at that time to permit a complete survey. When "Project Polaris" got underway the opportunity for a complete study presented itself. First Lieutenant Frank O. Klein accepted this responsibility and went all out in pursuit of definite information on magnetism. In Frank Klein's own words:

"It all began when we were told in textbooks and by the authorities that any magnetic compass was useless in the Arctic. The magnetic compass was said to fluctuate wildly because of proximity to the north magnetic pole. But as is often the case, conventional wisdom was proven to be flawed.

"As chance would have it, I had been appointed the 'Flight B Navigator', whose primary area of concern within the Arctic encompassed the islands of the Canadian Archipelago. This was the area within which the north magnetic pole was to be found.

"To my surprise, early flights in the fall of 1946 suggested that the fluxgate compass was not entirely useless. Although the indicator typically oscillated slightly in the region (2 to 3 degrees), the requisite sensitivity for directional indications appeared always to be given. Unfortunately, its navigational use was precluded since the magnetic variation (declination) values depicted on our charts were purely extrapolated values, could not be immediately corroborated, and obviously could not be relied upon. A plan of action suggested itself. I would ask our Flight B navigators to read and record the fluxgate compass indication every time a true heading value was obtained from the astro-compass. This procedure could be made optional for navigators in the other flights of our squadron. Since a great many polar flights were being planned, these flights could produce sufficient magnetic variation values to develop a reliable chart of polar isogonals. Such a chart would provide polar navigators with a backup means of navigation, particularly in an emergency. At this time, a search for the current location of the north magnetic pole was at best an afterthought; but the afterthought provided a valuable by-product.

"Since the contemplated project was not a part of our squadron's assigned mission and would involve additional work for our navigators, I sought approval for the work plan from my immediate supervisor, the Squadron Navigator, Norbert Zwicke, who, true to form, gave his approval and enthusiastic support.

I. THE DEVELOPMENT OF AN ARCTIC MAGNETIC CHART

"Sufficient data had been collected and analyzed by the end of 1947 to prepare a chart depicting isogonals north of the North American continental shelf to 85°N latitude and roughly from the

western half of the Canadian Archipelago westward to the International Date Line. The chart reflected approximately 600 mean variation values computed from data recorded by a number of navigators.

"The individual magnetic variation values were determined by comparing true headings obtained from an astro-compass with magnetic headings simultaneously obtained from the fluxgate compass. In a large percentage of the magnetic observations, readings were averaged over a two-minute period and compared with the true heading value existing at the mid-period of the observation. Consequently, the total of individual magnetic readings considerably exceeded 600. The chart was sectorized into many areas, for each of which mean variation values were determined. The average probable error for the mean was calculated to be no more than three.

"The subject chart was published in Vol. 30, No. 2, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION (AGU), for April 1949. In addition, the AGU extended its membership to the author. The Department of Commerce, U. S. Coast Guard and Geodetic Survey also accorded recognition to the project in a letter to Lt. Klein stating, '...the availability of the data and the chart have been of great specific value to this Bureau in preparing magnetic charts...'

II. THE SEARCH FOR THE MAGNETIC NORTH POLE

"By mid-year 1947 sufficient data (1000 determinations) had been collected within the Canadian Archipelago to provide some surprising findings. For one, the fluxgate compass was responsive to the relatively weak horizontal component of the earth's magnetic field in almost all of the region. The exception was a small elliptical-shaped area whose axis extended NW-SE from Boothia Peninsula to the Bathurst Islands, about the area of Montana, which is small compared to the 5,500,000 square miles of the Arctic ocean. Although magnetic readings were sometimes possible within this area, they were often erratic and unreliable. However, sufficient data became available to yield unexpected and confusing results. From a navigational standpoint, it appeared we were confronted not with one, but with three magnetic poles. A more critical analysis became necessary. This analysis indicated that only one of the poles met the acid test of complete isogonal convergency. This was the central pole on northwestern Prince of Wales Island, at $73^{\circ}30'N$ - $101^{\circ}00'W$ as reported at that time.

"The two foci of the ellipse, one on Bathurst Island and the other on Boothia Peninsula were particularly perplexing. Neither of the two indicated complete isogonal convergency. Of the two, the area on Bathurst Island was more complete in this respect. (Incidentally, the Air Force charts current at the time depicted the magnetic pole on Boothia Peninsula).¹ Then, too, we had experimented with a number of "homing" missions which had successfully "homed-in" on each of the two foci. This was particularly significant since it suggested that the two local poles could prove of singular importance in a polar navigational emergency. Furthermore, I had personally witnessed complete fluxgate indicator gyrations at only three locations on all of my missions in the Arctic - and these were very near or at the three subject locations. These conditions prompted the reference to two local or secondary poles - one on the Bathurst Islands at $75^{\circ}35'N$ - $103^{\circ}30'W$ (the more dominant secondary pole) and the other on Boothia Peninsula at $70^{\circ}40'N$ - $97^{\circ}20'W$.

"It was not long after these findings had been officially reported that we learned that a Canadian ground expedition had been sent into the Canadian Archipelago with the specific mission of locating the position of the north magnetic pole. This expedition could not confirm our indications of secondary poles on Boothia and Bathurst. However, a letter dated July 21, 1948, written by R. Glenn Madill, Chief of Terrestrial Magnetism, Department of Mines and Resources, Canada, addressed to Lt. Frank O. Klein stated, '...However, we agree on one point and that is the presence of what we can call the main magnetic pole on northwestern Prince of Wales Island. I have accepted as a purely preliminary value the position latitude 73°N and longitude 100°W . Your value of $73^{\circ}15'\text{N}$ and $99^{\circ}45'\text{W}$ is in excellent agreement, and I suggest that you use your value by all means...' This is astounding! Being just a few miles from the ground expedition's results!"

A United States Air Force nationwide press release on October 19th, 1947 announced the discovery of the three magnetic north poles - unfortunately without qualification. Although Frank Klein was never accorded any formal recognition from the USAF for his efforts, he nevertheless has remained thankful for the fortune of having been a member of the 72nd Recon Squadron (VLR) Photographic. It was only by virtue of his having been an Air Force member of that unit, that aerial terrestrial magnetic research in the Arctic was made possible.

In the words of 1st Lt. David J. Haney, another outstanding navigator in the squadron and author of *Navigation North of Seventy*: "As is so often the case, Klein's co-workers did not always appreciate the hours of study and hard work he did on this project. His findings, probably more than any other single project, have been responsible for the attention focused on the organization by scientific agencies. The much-deserved recognition for his work came when he was invited to accept membership in the American Geophysical Union. This honor is not only a hard-earned recognition for Klein, but also for the squadron and the Air Force."