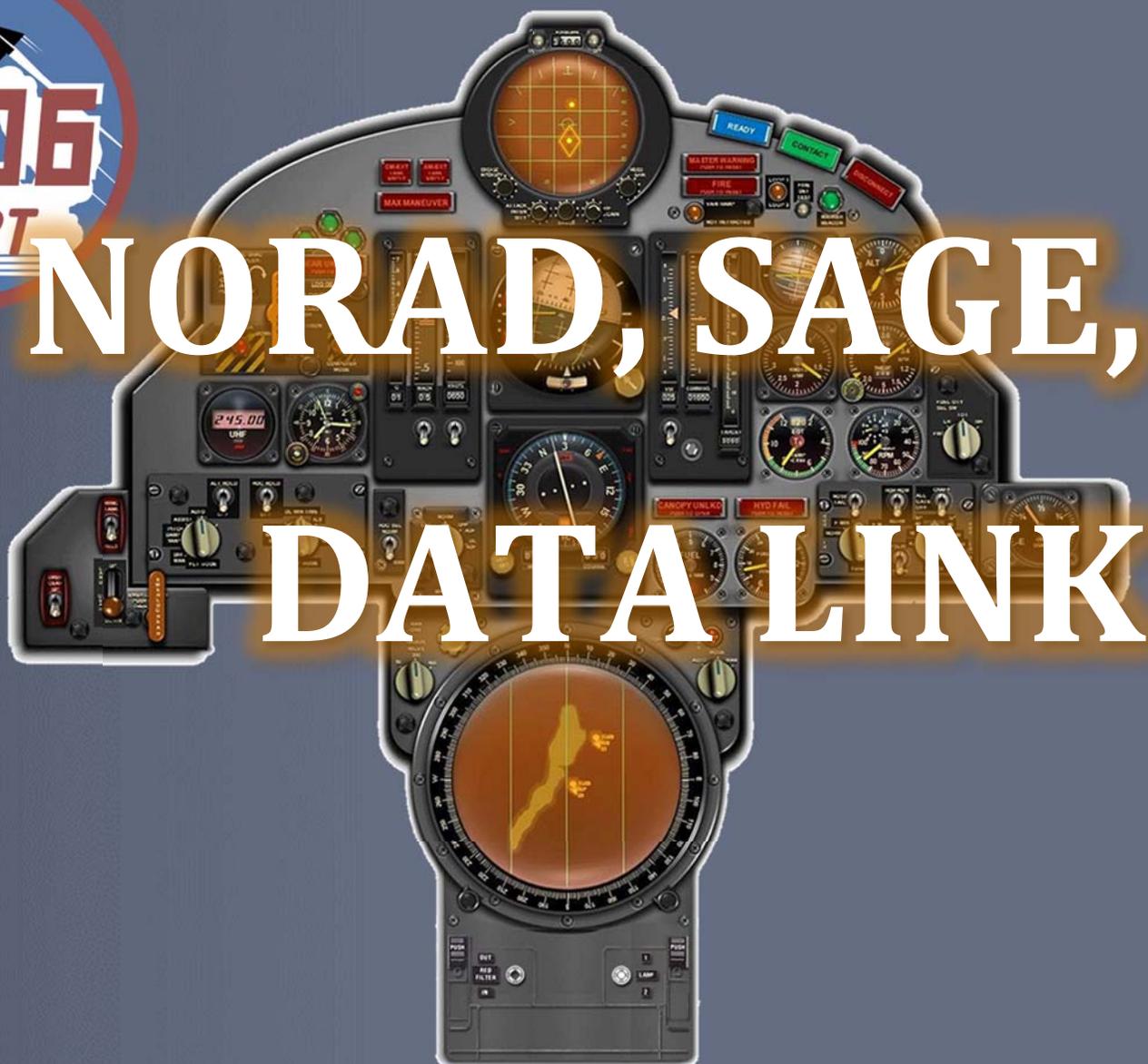


Mark B. Foxwell



NORAD, SAGE, DATA LINK



NORAD, SAGE, Data Link

By Pilot Mark B Foxwell, LtCol USAF (Ret)

The **F-106 Delta Dart** was very thoroughly integrated into North American Air Defense, NORAD, a combined organization of the United States and Canada that provided aerospace warning, air sovereignty, and protection for Northern America.

It had complete radar coverage of all of the airspace from the Distant Early Warning (DEW) Line, radar stations in the far northern Arctic region of Canada, with additional stations along the North Coast and Aleutian Islands of Alaska, in addition to the Faroe Islands, Greenland, and Iceland. All of these radars sent data to Semi-Automatic Ground Environment (SAGE), a system of large computers and associated networking equipment that coordinated data from many radar sites and processed it to produce a single unified image of the airspace over a wide area.

Weapons controllers sat at large computer displays that showed all of the tracks that the radars detected as symbology; so SAGE controllers could detect unknown or suspicious tracks; they could, then, scramble any interceptor that was on alert and “pair” them in the SAGE computer to the target track.

SAGE would then send coded UHF “DATA LINK” transmissions to the airborne fighter(s) no UHF voice commands were required. The data link “commands” told the interceptor what speed, heading and altitude to fly (as computed by the SAGE ground computer) as well as the

relative bearing and range to the target. These were referred to as "Close Control" CC commands and were sent to all kinds of NORAD interceptors, like F-89s, F-101s, Canadian F-101s, F-102s, F-104s and F-106s.

In the F-106 the CC commands were clearly displayed for speed and altitude on its vertical tape instruments; heading commands were displayed on the HSI (Horizontal Situation Indicator) and as a steering dot on the radar scope. But, only the F-106 also received Modified Close Control (MCC) data info which was the target's Lat/Long position, altitude, speed, and track.

This info was processed by the USAFs first ever airborne digital computer and was displayed on the Six's Tactical Situation Display (TSD) a round flat display near the cockpit floor between the pilot's feet. The Six navigation system (in the digital computer) placed the Six in Lat/Long on that map based on standard TACAN signals the Six was receiving; but it also placed the target symbology on that map based on MCC data link data.

The Six computer could also generate intercept "Command Data" (speed, heading, altitude and intercept geometry. Whether those commands were CC, generated by SAGE, or MCC generated by the Six computer based on MCC target data, the pilot had the option of coupling the Automatic Flight Control System (AFCS) and the computer would then control the pitch, heading and altitude of the jet (but it did not change throttle settings; they still had to be set/changed by the pilot). The AFCS was designed to take some workload over from the pilot to let him devote more attention to the radar and IRSTS for finding, locking on to and if warranted, firing at the target. I NEVER USED the AFCS because I had to be proficient at doing all this myself in case the AFCS or data link failed, BESIDES I always wanted to control things myself and not just "***be along for the ride***". – Mark

Vertical tapes, radar scope, HSI and TSD between the pilot's feet.

