MIP-RADNET ACCS Integration

MIP-RADNET is a surveillance system ACCS integration solution which covers the total air space of designated areas, countries, and enables controlled data sharing within neighbouring NATO countries.

MIP-RADNET integrates an unlimited number of radars, ADS-B and Multilateration systems, with an unlimited number of Air Operations Centers simultaneously. It is a format and protocol converter where sensor data can travel unhindered throughout the system ensuring seamless integration of the Air Traffic network. Furthermore, MIP-RADNET provides unique plot position correction capabilities.

The system can be used with all display systems. The centers can be Military Air Operations Centers, air traffic control centers, airport towers - or even mobile centers, as MIP is easy to connect on-site where needed.

As such, radars with one format or protocol can be connected to an air traffic center with a different display system format or protocol.

With this increased flexibility, air traffic centers can support each other, thereby giving each center wider radar coverage and increased display range.

Furthermore, this overlap of centers and radars allows for fewer centers to be operational when the amount of air traffic decreases and, more importantly, greatly increases air safety, should a radar break down.
1) SYSTEM ADAPTABILITY
Protocols received from sensors vary, as do the protocols required by users and centers. MIP-RADNET receives sensor data of any protocol, such as RSRP, Catcas, HADR, and Asterix. Data is transmitted to Air Operations Centers in any format (synch, asynch, or network) regardless of received protocol.

2) RUN OLD AND NEW SYSTEM IN PARALLEL
During the ACCS start-up period, MIP-RADNET can feed both ACCS and MASE in parallel.

3) CONTROLLED DATA SHARING
ACCS radar data can be shared beneficially between countries - but the extent and nature of radar data sharing can be controlled with MIP-RADNET. Radar data is transmitted securely, and to pre-selected areas or countries only. Data is filtered to allow transmission of restricted radar data only. ACCS radar information can be selectively filtered to ensure that certain ACCS radar information is not transmitted.

4) RADAR DATA QUALITY CONTROL
The rather extensive quality criteria required by ACCS are checked and fulfilled before connecting to ACCS. MIP-RADNET analyses all radar data parameters, and establishes whether each radar in the network adheres to the high quality criteria of ACCS. The system analyses and documents any errors and uncertainties of every radar, and is used to compensate for these. Sensor performance is continually monitored over time by means of the Sensor Performance Monitor (SEP).

5) TIME STAMPING
To enable ACCS to deliver the correct plot time, the radar data must be time logged correctly and consistently. MIP-RADNET ensures consistent time-stamping, and compensates for any delays inherent to a radar. As such, ACCS is fed with consistent and time-reliable plots.

6) ONLINE PERFORMANCE MONITORING (OPM)
MIP-RADNET can be extended with a real-time online radar performance monitoring system. OPM provides real-time coverage information, degradation alarms, and performance status of all radars in the network.

7) Data transmission
Data transmission to all parties concerned via network or point to point is evaluated before the integration with ACCS. MIP transfers data via the network only. Therefore no point-to-point communication is required.

8) ACCS to Radar Connection
Basically each radar must have an available plot port to ACCS. However, MIP-RADNET is the intermediary between the radar and ACCS.
The MFC software improves the plot position by the following corrective factors (1) to (7). These corrections improve the statistical correlation coefficient between the position of the plot on the screen and the actual position of the target from a size order of 0.80 - 0.85 to a size order of 0.95 - 0.98.

On account of inherent factors in any radar system as a total entity, it is unachievable to obtain a correlation coefficient of 1.00. The importance or weight of the corrections is not equal for all features.

1. Optional slant range to ground range correction
In order to utilize multiple radars, it is necessary to compensate for the differences in the distance between slant range (the direct distance from the radar to the target) and ground range (the distance from the radar to the target at ground level). Therefore, MIP is able to compensate for the curvature of the earth by using an improved formula superior to the Pythagoras formula.

2. Radar antenna azimuth non-linearity correction
Variations in the antenna's angle velocity - or non-linearity in the antenna's movement as a function of time - causes the antenna to be either ahead or behind it's ideal angle position. This error is compensated for MIP-RADNET by means of input received from the Radar System Tester (RST).

3. Radar sweep curve correction
In order to further increase the accuracy of the plot position, MIP compensates for the fact that the radar sweep is not a straight line but a curve caused by the antenna's rotation while the radar pulse is traveling to the target and back again. All can be selectively filtered.

4. Range Off-set correction
In the event an error in the zero range is observed, the MIP software allows for a range off-set, which enables the Technician to compensate for such error.

5. Range gain adjustment correction
Similarly to point (4) above, a range gain error may occur, which the Technician can compensate for by means of the MIP software.

6. Azimuth Off-set correction
In the event an error in the azimuth reference is observed, the MIP-RADNET software allows for an azimuth off-set. This enables the Technician to compensate for such an error. (This feature is used when multiple radars are in operation simultaneously to compensate for individual magnetic variations.)

7. Multi-scan correlation for optional plot filtering
This tool contained in MIP-RADNET reduces the number of false radar signals (non-targets). False Alarm signal ratio increases proportionately to the number of connected sensors.

Empirically, the importance of plot correction factors can be quantified as follows:

(1) Slant-ground range correction: 20 %
(2) Non-linearity correction: 60 %
(3) Sweep curve correction: 20 %

Factors (4), (5), (6), and (7), are only relevant in case related errors are observed.