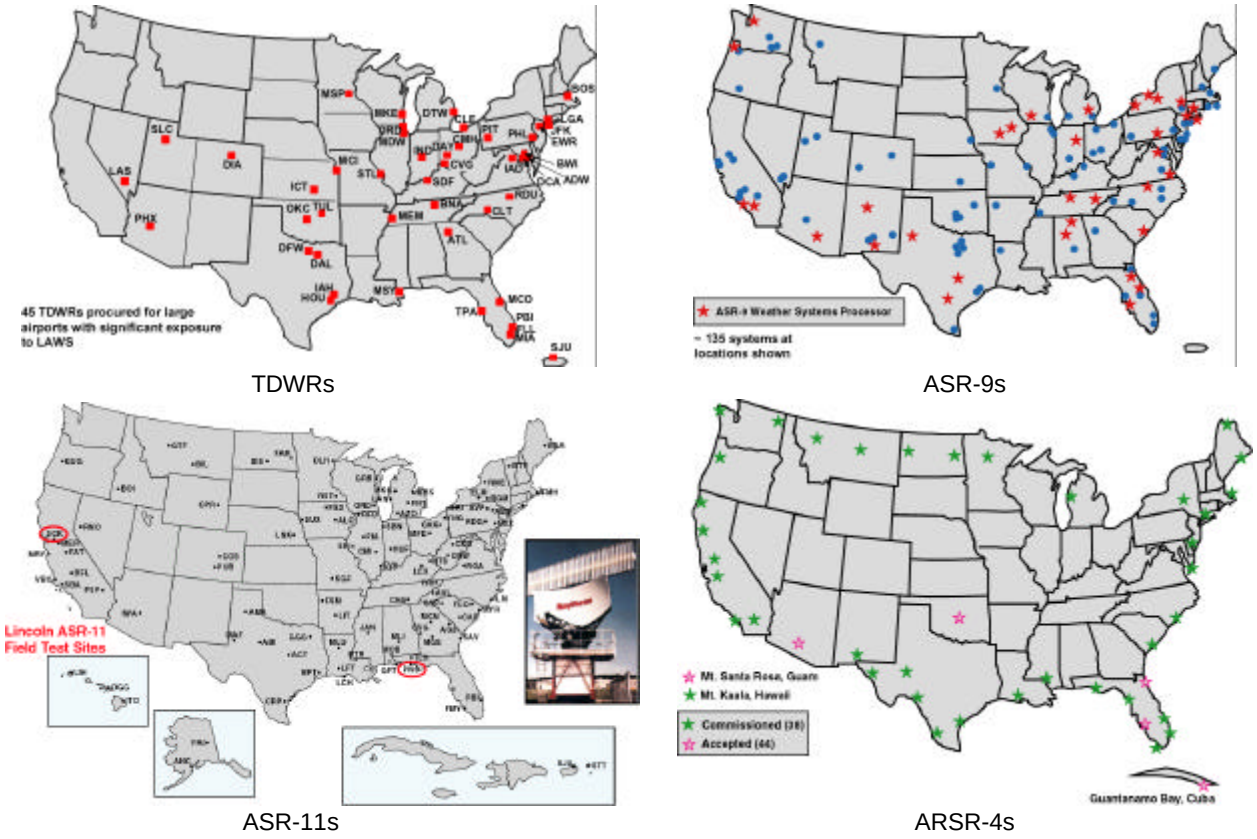

Figure 1. Locations of FAA surveillance radars.

Table 1. Parameters of the FAA Surveillance Radars

	TDWR (Raytheon)	ASR-9 (Northrop Grumman)	ASR-11 (Raytheon)	ARSR-4 (Northrop Grumman)
Transmitter				
Frequency	5.5 - 5.65 GHz ~ C Band	2.7-2.9 GHz	2.7-2.9 GHz	1.2-1.4 GHz
Polarization	Linear	Linear or Circular	Linear or Circular	Linear or Circular
Peak Power	250 KW	1.1 MW	20 kw	60 kw
Pulse Width	1.1 µs	1.0 µs	1.0 µs, 80 µs	150 µs
PRF	2000 (max)	2 CPIs (~ 1000 Hz avg.)	4 CPIs (~ 1000 Hz avg.)	9-pulse CPI at variable spacing (288 Hz avg)
Receiver				
Sensitivity	0 dBz @ 190 km 1 m^2 @ 460 km	0 dBz @ 20 km 1 m^2 @ 111 km	0 dBz @ 20 km 1 m^2 @ 111 km *	0 dBz @ 10 km 1 m^2 @ 370 km
Antenna				
Elevation Beamwidth	0.55 Degrees (min)	5 Degrees	5 Degrees	2 Degrees (stacked)
Azimuth Beamwidth	0.55 Degrees	1.4 Degrees	1.4 Degrees	1.4 Degrees
Power Gain	50 dB	34 dB	34 dB	35 dB (transmit), 40 dB (receive)
Rotation Rate	5 RPM (max)	12.5 RPM	12.5 RPM	5.0 RPM
* 17dB sensitivity reduction in short-pulse processing range (0 - 6.5 nmi)				

appropriate flight track point set via a unique number. FAA flight track radar points consists of coordinates for each radar contact point along the flight track.

2.3 – Accuracy of the FAA ASR-9 Radar

Given the magnitude of the safety functions that are demanded of the FAAs ASR-9 radar, it is not surprising that the radar is extremely accurate/reliable relative to the positional information that it provides.

It is documented in the Federal Aviation Technical Instruction Manual (TI 6310.24) that the MSP ASR-9 radar provides a range accuracy of 1/32 Nautical Miles and the azimuth accuracy is within .088 degrees (please refer to Figure 2.2).

Section 3 – Validation of Flight Track Positional Accuracy

In an effort to address the concerns of the residents regarding appropriate INM flight track locations, an evaluation of the radar flight track data was conducted. The following documentation provides specific information regarding this effort.

3.1 – Assessment Methodology Considerations

Consistent with the concerns expressed by the 5100 POP Group, a commitment was made to evaluate the flight tracks used to develop the MSP Part 150 Update contours. In an effort to provide a thorough evaluation of this contour development variable, MAC staff commenced an evaluation of the data used to develop the INM flight tracks. Thus, an evaluation of flight track location information was conducted relative to the location of observed aircraft over flights. It was determined that the most effective way to verify the radar flight track data was to determine the location of an over flight in the area of concern and compare it to the available flight track location data.

Several methods of identifying observed over flight locations were considered. The goal of the location assessment methodology was to determine a point on the ground where the aircraft was observed passing directly over. Triangulation of the aircraft altitude and distance from a measured point was contemplated, but no accurate measurement of distance from the ground to the passing aircraft was identified. Consequently, the method employed to determine ground location was a direct observation of the over flight location by one MAC staff member and one Minnesota Pollution Control Agency (MPCA) representative. Although this method seems simplistic, the theory was that with fewer measurements being made there would be less total error compounded during the procedure. This observation method is consistent with the method used by the 5100 POP representatives.

3.2 – Flight Track Monitoring Process

MAC and Minnesota Pollution Control Agency (MPCA) staff visually observed the arrival flight path of aircraft over flights and used a Global Positioning System (GPS)