7.3.2 Ground Based Radar Systems

The Raytheon Cobra Dane (AN/FP) was implemented as part of the USA ballistic early warning system during the 1970'S. Its secondary purpose was the search and track of satellites. Table 7-4 is a more detailed list of its radar parameters. The tracking accuracy quoted in Table 7-4 was estimated by the author. Another (unattributable) source quoted 0.4 km, 50 cm/S and $\pm 0.1^{o}$ as the typical tracking accuracy obtainable using the NORAD (Northern Radar Air Defense) network.

7.3.2.1 Summary or Ground Based Radars

Skin tracking of passive low earth orbiting satellites has been performed by a number of US systems using technology dating back to the 1950's. Skin tracking of GEO satellites is another proposition with ranges 10 times that quoted for the Millstone Hill radar. (Due to the '4th power' law governing radar range, a factor of 10 in range is equivalent to a factor of 10,000 in power, all other parameters being equal.)

Converting ground based radar accuracy to predicted orbital element accuracy is a complex problem, but it has been addressed in [53], which describes the mathematical basis for a software program known as SEEM (Satellite Ephemeris Error Model) published by Analytic Services Inc, Arlington, Virginia. The model reportedly accommodates drag forces for satellite altitudes above about 180 km, encompassing both sensor measurements and prediction times of up to at least nine hours. The model validity accommodates non-central forces gravitational fields for low altitude satellite passes across as many as three earthbased radars, over somewhat longer measurement and prediction time intervals. Assumptions here are:

(a) Current capability for predicting drag forces

(b) Current understanding of geoid and other gravitational perturbations

(c) No radical radar accuracy improvements beyond current state-of-the-art.