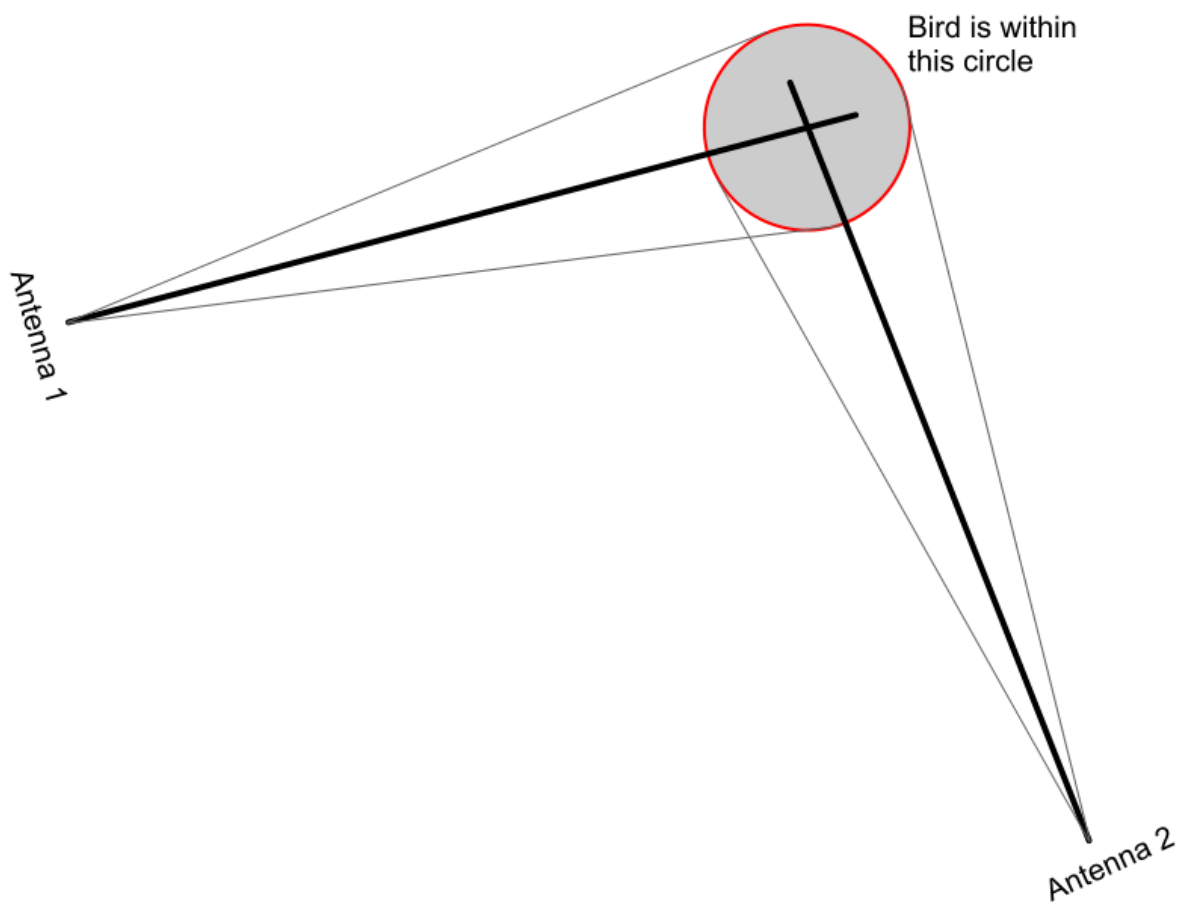


## TRACKING GOLDEN EAGLES

**The first attempts to track golden eagles used radio signals, triangulation and Doppler shift; they weren't very precise.**

The earliest attempts to locate golden eagles using technology involved fitting a radio transmitter to a bird. This was could, hopefully, be located using a handheld directional aerial. By, moving the aerial the strongest signal from the transmitter could be detected which indicated the direction to the bird. If two aerials were used, suitably separated on the ground, a bird's location could be identified by triangulation. There was, however, considerable spatial error attached to this approach and only a limited number of locations could be found in a day.



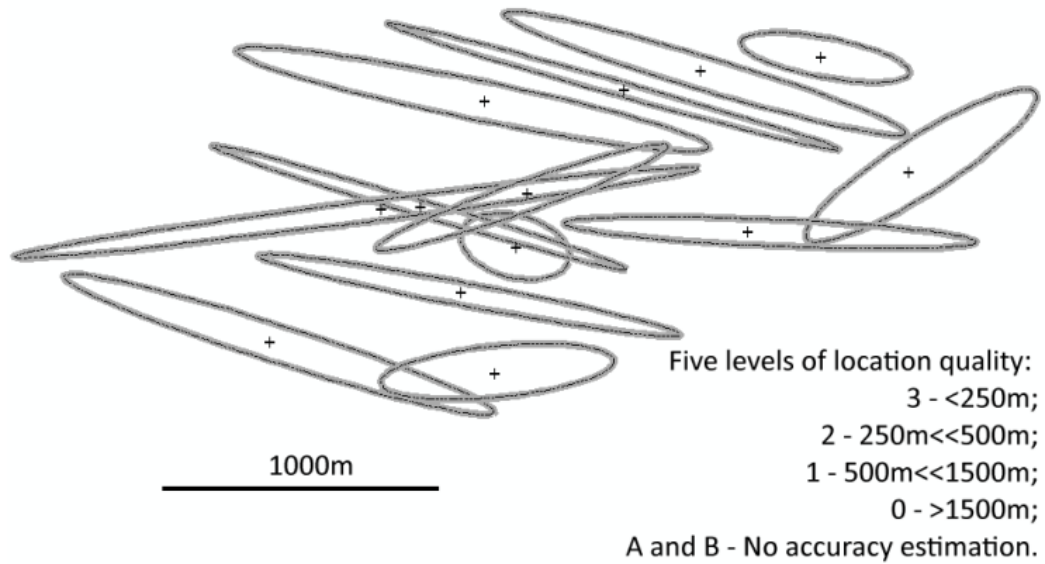
Subsequently, long-lived satellite-received transmitters (Platform Transmitter Terminals PTTs) were developed which allowed birds to be tracked throughout the first years of their life without the need for people trying to locate them with an aerial. These devices communicate with Argos satellites (a multinational project). There are seven Argos satellites in polar orbits.

A location is found by making use of the Doppler shift effect (a change in a wavelength from a moving object which you will have heard as a police or ambulance siren changes pitch as it approaches and passes you). If the PTT can get simultaneous signals from several Argos satellites a location can be obtained, again using triangulation.

The location is best described an ellipse of probable location which has a range of accuracies depending on the number of satellites 'visible' to the PTT and their relative positions in the sky.

Although the accuracy may be relatively coarse (no better than 250m) it was useful to record how golden eagles move across Scotland.

### Doppler location uncertainty ellipses



Periodically the PTT would upload its location history to the satellites which could then be sent on to the researchers.