ANNEX C

The Principles of Pulse Doppler Radar[63]

As described in Annex B, synthetic aperture radar exploits the doppler effect to obtain high resolution of stationary targets being observed from a moving radar. Another very useful exploitation of the doppler effect can be made in the observation of moving targets, such as aircraft, ships, or vehicles on the ground, which return echoes that are much smaller than those from the surrounding ground or ocean, especially when observed from above. For this application the platform on which the radar is mounted can be either stationary, or if it is moving, its motion can be compensated in the signal processing.

To measure range, a radar needs to transmit energy in short pulses. The shorter the pulse, the more precisely can targets at slightly different ranges be resolved. But to detect motion, the pulse must last long enough to observe any shift in the frequency away from that of the original transmitted pulse. As seen from a moving radar, the unwanted background is also moving, so what must be detected is the difference between the Doppler shifts of the small moving target and of the much larger background.

The eventual display will suppress all of the echoes from fixed reflectors, and show only the positions of those that are moving with respect to the background.

Because the reflections from small objects such as aircraft are usually weak, and because it is not possible to integrate the combined results of many pulses in the same manner as is done with synthetic aperture radar, pulse doppler radars intended to detect aircraft at long ranges require considerable transmitter power.

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[63] Stimson, pp. 243 - 366.