

There are two types of Side Looking Radar Systems (SLAR) commonly used for remote sensing purposes: Real Aperture Radars (RAR) and Synthetic Aperture Radars (SAR). Each system has basic differences which directly influence data quality. As the name suggests, SLAR systems operate by illuminating the terrain to the side of the aircraft, at significant stand-off ranges of 25-100 km away from the target. The earliest airborne radar surveillance systems used unfocused Side Looking Airborne Radar techniques known as Real Aperture Radars (RAR). Resolution of RAR systems is determined by the length of the antenna which transmits and receives the microwave pulses.

Synthetic Aperture Radars (SARs) were developed to overcome the serious resolution limitations of RARs as a result of restrictive antenna lengths. By performing computations on the received radar signal which incorporate the aircraft's own forward movement, SARs create the effect of focusing the radar image through creation of a "synthetic" antenna up to a kilometre or more in length. SAR resolution is virtually independent of altitude and stand-off range, unlike the earlier RARs. SAR has an improved resolution over RAR by a factor of one hundred or more. Early SARs were limited because of the cumbersome optical processors required for the synthetic focusing operation. The newer commercially available state-of-the-art SARs are now capable of processing real time synthetic aperture information on-board relatively small twin engine turbo-prop aircraft. SAR systems can also incorporate a Moving Target Indicator (MTI) that automatically cues the operator to moving targets within the radar scene. The wide swath coverage enables very large areas to be searched quickly and comprehensively.

Commercial SAR systems can acquire data in various modes: for example high resolution mode (20-25 km swath width) or wide swath mode (40-50 km swath width) from an operating altitude of 9000-11,000 m above ground level.

The SAR systems use real-time, on-board digital processing. The data products and replay capabilities include an interface for on-board, real-time display and