Intro :

* **ASR-11 is an Automated Digital Airport Surveillance Radar (DASR) utilized by the United States Defence and the FAA.**
* Upgrade to ASR-9, which was an analogue based radar system
* **Used to monitor air traffic as well as monitor weather patterns.**
* There are more than 400 ASR-11 antennas being used in major airports all across the world.
* Consists of two separate electronic subsystems, a primary radar and a secondary surveillance radar often referred to as the beacon.
* **The antenna has a horned shaped reflector that forms two cosecant-squared beams to allow high elevation gain.**
* **Transmitted signals which reflect off the surface of aircraft are received and processed to measure the echo delay and the direction.**
* This information is sent to an Air Traffic Control tower with a digital tag that describes the location, heading, and speed at which the aircraft is moving.

Performance Parameters :

* **Frequency : 2.7–2.9 Ghz (S-band)**
* PRF : 4 CPIs (~1000 Hz avg.)
* **Beamwidth : 1.4° (Azimuthal), 5° (Elevation)**
* Pulsewidth : 1.0 μs, 80 μs
* RPM : 12.5 RPM
* **Range : 60 mi (97 km)**
* Average Power : 2.1kW
* Effective Power : 25 kW
* Peak Power : 20 kW
* **Transmitted Power : 160-1500 W**
* Range Resolution : 926 m
* Maximum Altitude : 24000 feet
* Measurable Velocity Range : 50-700 knots
* **Polarization : Linear or Circular**
* Minimum SNR of received signal : 20 dB
* Maximum number of targets : 700 aircraft
* Maximum Data latency : 2.2 s
* **Gain : 34 dB**
* Sensitivity : 0dBz at 20 km
* Engine Generator - The equipment used on the ASR-11 is 50 kW generator engine.
* Display Systems : (Picture included)

1. Automated Radar Terminal System (ARTS)
2. Common Automated Radar Terminal System (CARTS)
3. and Standard Terminal Automation Replacement System (STARS)

Advantages :

* Low peak-power, solid state transmitter with pulse compression technology
* Utilizes a pulse sequence diversity, limiting processing to a small number of pulses.
* Reduction in the range from the nearest radar to many areas of operational concern.
* Significant increase in the rate at which rapidly changing weather systems (e.g., severe storms) are scanned.

Disadvantages :

* Reduction in Doppler resolution, resulting in a decreased ability to process live weather conditions
* Extra equipment required to measure close range aircraft.

References :

* <https://www.faa.gov/air_traffic/technology/asr-11/>
* [https://www.researchgate.net/](https://www.researchgate.net/figure/RCS-polar-plot-for-the-F-16C-model-at-the-same-level-at-10-GHz-the-aircraft_fig2_321082973)
* <http://www.tc.faa.gov/its/worldpac/techrpt/cttn9727.pdf>
* <https://www.cv.nrao.edu/~rfisher/Radar/WW-10147.pdf>