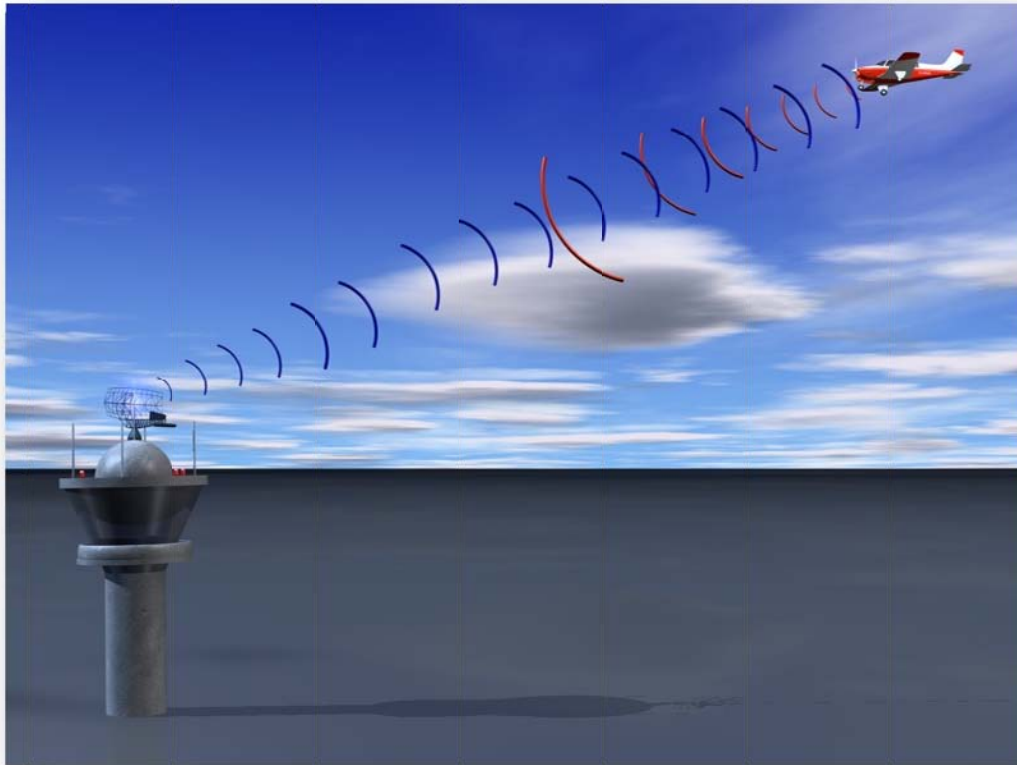


PSR : Primary Surveillance Radar



The primary radar system sends out a pulse of radio energy. A very small portion of this energy will be reflected by any object within its range.

The azimuth orientation of the radar antenna provides the bearing of the aircraft from the ground station, and the time taken for the pulse to reach the target and return, provides a measure of the distance of the target from the ground station. The bearing and distance of the target can then be converted into a ground position for display to the Air Traffic Controller.

Primary radar works best with large all-metal aircraft, but not so well on small, composite aircraft. Its range is also limited by terrain and rain or snow and also detects unwanted objects such as automobiles, hills and trees. Furthermore it cannot always estimate the altitude of an aircraft.

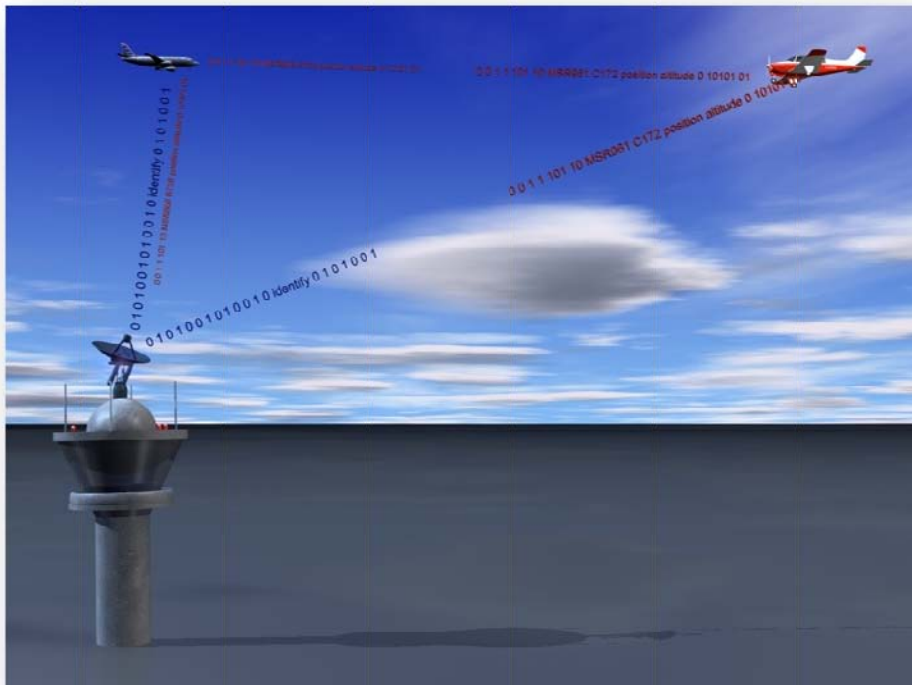
advantage:

- operates totally independent (does not have to wait for an aircraft response)

disadvantage:

- requires a lot of radiation power
- weather influences distort the signal
- Identification required Controllers instruction
- no altitude information

SSR : Secondary Surveillance Radar



Secondary radar overcomes the limitations of the primary radar but it depends on a **transponder** in the aircraft to respond to interrogations from the ground station to make the plane more visible.

Thus SSR is a 'dependant' surveillance system. For this reason, PSR will operate in conjunction with SSR in certain areas for the foreseeable future so that 'non-cooperating' targets, such as some light aircraft, can be detected.



Transponder

The transponder is a radio receiver and transmitter operating on the radar frequency. The target aircraft's transponder responds to interrogation by the ground station by transmitting a coded reply signal. The great advantages of SSR are three:

- the reply signal is transmitted from the aircraft it is much stronger when received at the ground station, thus giving the possibility of much greater range and reducing the problems of signal attenuation;
- the transmitting power required of the ground station for a given range is much reduced, thus providing considerable economy;
- the signals in each direction are electronically coded the possibility is offered to transmit additional information between the two stations



Transponder equipment Modes:

Mode A:

In this mode the aircraft's transponder provides positive aircraft identification by transmitting a four-digit code to the ground station. The code system is octal; that is, each of the code digits may be any of the numbers 0-7. There are thus 4096 possible four-digit codes (*e.g.* 3472).

Mode C:

In this mode the aircraft's transponder sends the 4-digit squawk code (like mode A) but also the **pressure altitude at which the aircraft is flying**



Mode S: (selective interrogation)

Since traffic has increased significantly over the years the 4096 squawk code combinations are no longer sufficient for unique aircraft identification.

Mode S (Mode Select) is designed to help avoiding overinterrogation of the transponder (having many radars in busy areas) and to allow automatic collision avoidance. Mode S transponders are 'backwards compatible' with Modes A & C plus it sends out the aircraft identification, selected heading, selected altitude, ... and much more.

Mode S is mandatory in controlled airspace in many countries. Some countries have also required, or are moving towards requiring, that all aircraft be equipped with Mode S, even in uncontrolled airspace. However in the field of general aviation, there have been objections to these moves, because of the cost, size, limited benefit to the users in uncontrolled airspace, and, in the case of balloons and gliders, the power requirements during long flights

Special Transponder codes

| | |
|------|--|
| 2000 | IFR uncontrolled |
| 1200 | VFR uncontrolled U.S. |
| 7000 | VFR uncontrolled non-U.S. |
| 7700 | Emergency |
| 7600 | Communication failure |
| 7500 | Hijack (not allowed to simulate on IVAO !) |

tip: this is how i memorize it :)

77 pray to heaven

75 call your wife

76 i hear nix

SQUAWK IDENT

In case ATC cannot find you on his radar screen you will be asked to "squawk ident". This means that the pilot is requested to push his **IDENT** button on the transponder which will cause a short blinking of the aircraft label on the radar screen



MODE CHARLIE

As soon as the pilot received the clearance for take-off ..or....when he is instructed to line up the active runway for departure...he will activate (switch on) the transponder and leave it on during the entire flight until the moment he leaves the runway at the destination airport.

If and pilot forgets to do so...ATC will remind him with the instruction:

TWR: "MSR606 mode Charlie"

MODE STANDBY

The transponder remains in standby mode (switched off) during taxi movements and at the gate.

If and pilot forgets to do so...ATC will remind him with the instruction:

GND: "MSR606 mode standby"

