

# Communications satellite advantages & disadvantages

Communications satellites provide a number of advantages

- ***Flexibility:*** Satellite systems are able to provide communications in a variety of ways without the need to install network fixed assets.
- ***Mobility:*** Satellite communications are able to reach all areas of the globe dependent upon the type of satellite system in use, and the ground stations do not need to be in any one given location. For this reason, many ships use satellite communications.
- ***Speedy deployment:*** Deployment of a satellite communications system can be very speedy. No ground infrastructure may be required as terrestrial lines, or wireless base stations are not needed. Therefore many remote areas, satellite communications systems provide an ideal solution.
- ***Provides coverage over the globe:*** Dependent upon the type of satellite communications system, and the orbits used, it is possible to provide complete global coverage. As a result, satellite communications systems are used for providing communications capabilities in many remote areas where other technologies would not be viable.

When considering the use of a satellite some disadvantages also need to be taken into consideration.

- ***Cost:*** Satellites are not cheap to build, place in orbit and then maintain. This means that the operational costs are high, and therefore the cost of renting or buying space on the satellite will also not be cheap.
- ***Propagation delay:*** As distances are very much greater than those involved with terrestrial systems, propagation delay can be an issue, especially for satellites using geostationary orbits.
- ***Specialized satellite terminals required:*** Even though the operator will operate all the required infrastructure, the user will still need a specialized terminal that will communicate with the satellite. This is likely to be reasonably costly, and it will only be able to be used with one provider.

## Communications satellite applications

There are many different ways in which communications satellites can be used:

- ***Telecommunications:*** Satellite systems have been able to provide data communications links over large distances. They were often used in place of intercontinental submarine cables which were expensive and unreliable in their early days. Nowadays cable technology has significantly improved to provide much higher levels of capacity especially as a result of fibre optic technology and their reliability has also greatly improved. As a result satellites are less frequently used to replace terrestrial cables, although in some instances this remains the case.
- ***Satellite phones:*** The concept of using a mobile phone from anywhere on the globe is one that has many applications. Although the terrestrial cellular network is widely available, there are still very many areas where coverage is not available. In these situations satellite phones are of great use.

As an example satellite phones are widely used by the emergency services for situations when they are in remote areas, even of countries that might have a good cellular network, but not in remote areas. They may

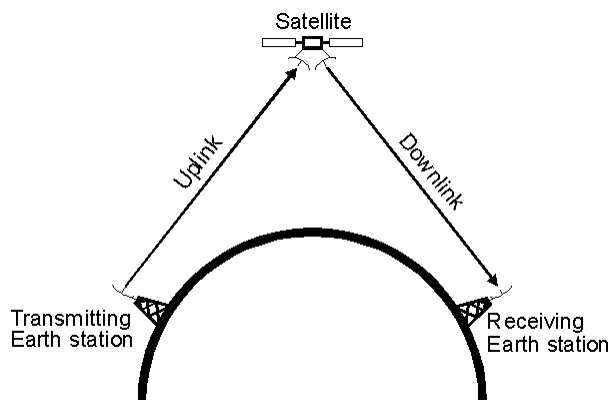
also be for communications in rural areas where no cellular coverage may be available. They also find uses at sea, and in developing countries, or in uninhabited areas of the globe.

- **Direct broadcast :** While terrestrial broadcasting is well established it has a number of limitations: namely the coverage, especially in hilly areas where the hills may shade the signals from receivers, and also the bandwidth which is prime spectrum in the lower end of the UHF portion of the spectrum.

Direct broadcast satellite, DBS, technology enables both these issues to be overcome. The high angle of the satellites means that for most latitudes a high angle of signal direction means that hills do not provide a major coverage issue. Also operating around 12 GHz, more bandwidth is generally available enabling more stations - both television and radio - to be accommodated.

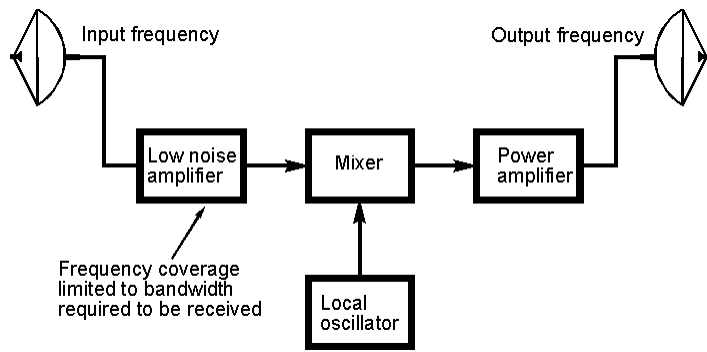
## Satellite communications basics

When used for communications, a satellite acts as a repeater. Its height above the Earth means that signals can be transmitted over distances that are very much greater than the line of sight. An earth station transmits the signal up to the satellite. This is called the up-link and is transmitted on one frequency. The satellite receives the signal and retransmits it on what is termed the down link which is on another frequency.



The circuitry in the satellite that acts as the receiver, frequency changer, and transmitter is called a transponder. This basically consists of a low noise amplifier, a frequency changer consisting a mixer and local oscillator, and then a high power amplifier. The filter on the input is used to make sure that any out of band signals such as the transponder output are reduced to acceptable levels so that the amplifier is not overloaded. Similarly the output from the amplifiers is filtered to make sure that spurious signals are reduced to acceptable levels. Figures used in here are the same as those mentioned earlier, and are only given as an example. The signal is received and amplified to a suitable level. It is then applied to the mixer to change the frequency. As a result the communications satellite receives in one band of frequencies and transmits in another.

In view of the fact that the receiver and transmitter are operating at the same time and in close proximity, care has to be taken in the design of the satellite that the transmitter does not interfere with the receiver. This might result from spurious signals arising from the transmitter, or the receiver may become de-sensitised by the strong signal being received from the transmitter. The filters already mentioned are used to reduce these effects.



Signals transmitted to satellites usually consist of a large number of signals multiplexed onto a main transmission. In this way one transmission from the ground can carry a large number of telephone circuits or even a number of television signals. This approach is operationally far more effective than having a large number of individual transmitters.