A local oscillator in the receiver produces a frequency that is different than the radio frequency of the carrier wave. These two frequencies are mixed in the mixer. Four frequencies result from this mixing. They are the radio frequency, the local oscillator frequency, and the sum and difference of these two frequencies. The sum and difference frequencies contain the information signal.

The frequency that is the difference between the local oscillator frequency and the radio frequency carrier wave frequency is used during the remaining processing. In VHF aircraft communication radios, this frequency is 10.8 MHz. Called the intermediate frequency, it is amplified before it is sent to the detector. The detector, or demodulator, is where the information signal is separated from the carrier wave portion of the signal. In AM, since both sidebands contain the useful information, the signal is rectified leaving just one sideband with a weak version of the original transmitter input signal. In FM receivers, the varying frequency is changed to a varying amplitude signal at this point. Finally, amplification occurs for the output device. *[Figure 11-85]*

Over the years, with the development of transistors, micro-transistors, and integrated circuits, radio transmitters and receivers have become smaller. Electronic bays were established on older aircraft as remote locations to mount radio devices simply because they would not fit in the flight deck. Today, many avionics devices are small enough to be mounted in the instrument panel, which is customary on most light aircraft. Because of the number of communication and navigation aids, as well as the need to present an uncluttered interface to the pilot, most complicated aircraft retain an area away from the flight deck for the mounting of avionics. The control heads of these units remain on the flight deck.

Transceivers

A transceiver is a communication radio that transmits and receives. The same frequency is used for both. When transmitting, the receiver does not function. The push to talk (PTT) switch blocks the receiving circuitry and allows the transmitter circuitry to be active. In a transceiver, some of the circuitry is shared by the transmitting and receiving functions of the device. So is the antenna. This saves space and the number of components used. Transceivers are half duplex systems where communication can occur in both directions but only one party can speak while the other must listen. VHF aircraft communication radios are usually transceivers. *[Figure 11-86]*

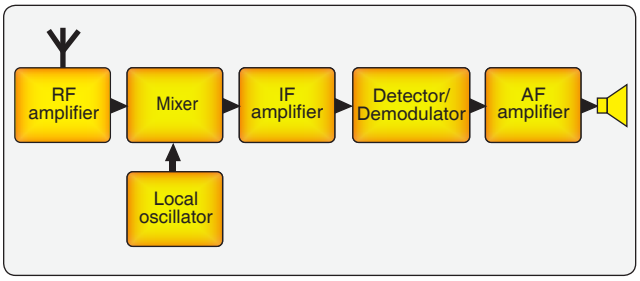

Figure 11-85. *The basic stages used in a receiver to produce an output from a radio wave.*

Antennas

As stated, antennas are conductors that are used to transmit and receive radio frequency waves. Although the airframe technician has limited duties in relation to maintaining and repairing avionics, it is the responsibility of the technician to install, inspect, repair, and maintain aircraft radio antennas.

Three characteristics are of major concern when considering antennas:

1. Length
2. Polarization
3. Directivity

The exact shape and material from which an antenna is made can alter its transmitting and receiving characteristics. Also note that some non-metallic aircraft have antennas imbedded into the composite material as it is built up.

Length

When an AC signal is applied to an antenna, it has a certain frequency. There is a corresponding wavelength for that frequency. An antenna that is half the length of this wavelength is resonant. During each phase of the applied AC, all voltage and current values experience the full range of their variability. As a result, an antenna that is half the wavelength of the corresponding AC frequency is able to allow full voltage and full current flow for the positive phase of the AC signal in one direction. The negative phase of the full AC sign wave is accommodated by the voltage and current simply changing direction in the conductor. Thus, the applied AC frequency flows through its entire wavelength, first in one direction and then in the other. This produces the strongest signal to be radiated by the transmitting antenna. It also facilitates capture of the wave and maximum induced voltage in the receiving antenna. *[Figure 11-87]*

Most radios, especially communication radios, use the same antenna for transmitting and receiving. Multichannel radios could use a different length antenna for each frequency, however, this is impractical. Acceptable performance can exist from a single antenna half the wavelength of a median frequency. This antenna can be made effectively shorter by placing a properly rated capacitor in series with the transmission line from the transmitter or receiver. This electrically shortens the resonant circuit of which the antenna