



Figure 11-137. A cockpit display of ADS-B generated targets (left) and an ADS-B airborne receiver with antenna (right).

ADS-B IN offers features not available in TCAS. Equipped aircraft are able to receive abundant data to enhance situational awareness. Traffic information services-broadcast (TIS-B) supply traffic information from non-ADS-B aircraft and ADS-B aircraft on a different frequency. Ground radar monitoring of surface targets, and any traffic data in the linked network of ground stations is sent via ADS-B IN to the flight deck. This provides a more complete picture than air-to-air only collision avoidance. Flight information services-broadcast (FIS-B) are also received by ADS-B IN. Weather text and graphics, ATIS information, and NOTAMS are able to be received in aircraft that have 987 UAT capability. [Figure 11-138]

ADS-B test units are available for trained maintenance personnel to verify proper operation of ADS-B equipment. This is critical since close tolerance of air traffic separation depends on accurate data from each aircraft and throughout all components of the ADS-B system. [Figure 11-139]

Radio Altimeter

A radio altimeter, or radar altimeter, is used to measure the distance from the aircraft to the terrain directly beneath it. It is used primarily during instrument approach and low level or night flight below 2500 feet. The radio altimeter supplies the primary altitude information for landing decision height. It incorporates an adjustable altitude bug that creates a visual or aural warning to the pilot when the aircraft reaches that altitude. Typically, the pilot will abort a landing if the decision height is reached and the runway is not visible.

Using a transceiver and a directional antenna, a radio altimeter broadcasts a carrier wave at 4.3 GHz from the aircraft directly toward the ground. The wave is frequency modulated at 50 MHz and travels at a known speed. It strikes

surface features and bounces back toward the aircraft where a second antenna receives the return signal. The transceiver processes the signal by measuring the elapsed time the signal traveled and the frequency modulation that occurred. The display indicates height above the terrain also known as above ground level (AGL). [Figure 11-140]

A radar altimeter is more accurate and responsive than an air pressure altimeter for AGL information at low altitudes. The transceiver is usually located remotely from the indicator. Multifunctional and glass cockpit displays typically integrate decision height awareness from the radar altimeter as a digital number displayed on the screen with a bug, light, or color change used to indicate when that altitude is reached. Large aircraft may incorporate radio altimeter information into a ground proximity warning system (GPWS) which aurally alerts the crew of potentially dangerous proximity to the terrain below the aircraft. A decision height window (DH) displays the radar altitude on the EADI in Figure 11-141.

Weather Radar

There are three common types of weather aids used in an aircraft flight deck that are often referred to as weather radar:

1. Actual on-board radar for detecting and displaying weather activity;
2. Lightning detectors; and
3. Satellite or other source weather radar information that is uploaded to the aircraft from an outside source.

On-board weather radar systems can be found in aircraft of all sizes. They function similar to ATC primary radar except the radio waves bounce off of precipitation instead of aircraft. Dense precipitation creates a stronger return than light precipitation. The on-board weather radar receiver