EXHIBIT NUMBER 3

TCAS ANTENNA CHARACTERISTICS

The TCAS directional antenna characteristics are defined by RTCA DO-185A as follows:

Antenna System

The equipment shall transmit interrogations and receive replies from top mounted and bottom mounted antennas.

Note: A TCAS II unit and Mode S transponder may share a single pair of antennas.

Polarization

Then antennas shall be vertically polarized.

Transmit Radiation Patterns

The TCAS II equipment shall be capable of providing directional interrogations from top-mounted antennas for surveillance of Mode C targets in densities up to 0.3 aircraft per sq. NMI. An omni-directional bottom transmit antenna is sufficient for TCAS II since most of the interrogations are transmitted from the top antenna in order to reduce susceptibility to mulitpath interference from the ground. The use of a bottom directional transmit antenna and the use of directional interrogations for surveillance of Mode S targets and for transmission of TCAS II Broadcast interrogations is optional.

The directional interrogation antenna shall generate an azimuth beam that is sequentially positioned to provide adequate surveillance coverage over 360 degrees azimuth. To ensure adequate coverage, the directional antenna 3 dB beamwidth in azimuth shall not be less than the separation between adjacent azimuth beam positions. Beamwidth control is further provided by the P2 suppression pulse as defined in DO-185A subparagraph 2.2.4.5.4.2.1. Also, the shapes of the antenna azimuth patterns shall be controlled such that a minimum-suppression transponder, defined as one that replies when the received ration of P1 to P2 exceeds 0 dB shall reply to interrogations from no more than two adjacent directional beams. The requirements of this paragraph shall apply for each elevation angle between +20 degrees and -15 degrees.

The shape of the elevation pattern at the azimuth peak-of-beam of each directional beam should match the shape of the elevation patterns of a matched quarter-wave stub within +/- 1 dB over 90% of the region from -15 degrees to +20 degrees in elevation when installed at the center of a 1.2 m (4 ft.) diameter (or larger) circular ground plane that can be either flat or cylindrical.

The gain of an omni-directional transmit pattern (if employed) should not be less than the gain of a matched quarter-wave stub minus one dB over 90% of a coverage volume from 0 to 360 degrees in azimuth and -15 to +20 degrees in elevation when installed at the center of a 1.2 m (4 ft.) diameter (or larger) circular ground plane that can be either flat or cylindrical.

If the antenna gain is not as specified above, the transmitted power shall be adjusted to satisfy the Power requirements specified in DO-185A subparagraphs 2.2.3.2 and 2.2.4.5.4.2.2.

Receive Radiation Pattern

A TCAS II that employs an omni-directional receive pattern shall meet all of the gain requirements specified in DO-185A subparagraph 2.2.4.7.2.1 for an omni-directional transmit pattern.

A TCAS II that employs a directional receive pattern consisting of four simultaneous directional beams shall meet the following pattern requirements when installed at the center of a 1.2 m (4 ft.) diameter (or larger) circular ground plane that can be either flat or cylindrical. The shape of the elevation pattern at the azimuth peak-of-beam of each directional beam shall match the shape of the elevation pattern of a matched quarter wave stub within +/- 1 dB over 90% of the region from -15 degrees to +20 degrees in elevation. The gain at the crossover points between adjacent directional beams shall not be less than the adjacent peak-of-beam gain minus 4 dB from -15 degrees to +20 degrees in elevation.

A TCAS II that employs a receive pattern consisting of more than four simultaneous directional beams shall meet the elevation pattern requirement stated above for the four-beam antenna. The gain, relative to peak-of-beam, at the crossover points between adjacent directional beams of this antenna shall match, within 1 dB, the gain required to account for the maximum closing speed that occurs in the direction of the crossover point.

If the antenna gain is not as specified above, the nominal receiver MTL shall be adjusted to account for the antenna gain.

Note: *For example, for a relative peak-of-beam antenna gain of -3 dB, the MTL value associated with a reply received via this beam shall be lowered by 3 dB.*

Use of a Directional Antenna for Mode S Interrogations

Availability of bearing information will allow Mode S interrogations to be made using a directional antenna. If a directional antenna is used for transmission of Mode S interrogations, the transmit radiation pattern shall be as specified in DO-185A subparagraph 2.2.4.7.2.1 with the exception that side-lobe suppression is not used.

Antenna Selection for Squitter Listening

The equipment shall monitor squitters via top and bottom antennas that are capable of simultaneous reception over 360 degrees of azimuth. If reception is switched, the switching times shall be controlled to avoid undesirable synchronism with the squitters transmitted by Mode S diversity transponders.

Note: *This can take the form of simultaneous reception using two receivers and two decoders or switched reception using a single receiver. Mode S transponders alternate the antennas used for squitter transmissions at nominal 1-second intervals. It is acceptable for TCAS II to switch antennas for squitter monitoring after two successive surveillance update periods.*

Antenna Selection for Interrogations and Replies

The equipment shall transmit each Mode C or Mode S interrogation via one or the other two antennas. Interrogations shall not be transmitted simultaneously via both antennas. Replies shall be received from the same antenna that was used to transmit the interrogation.