This report summarizes the NEC-BSC analysis of an S-band array antenna installed on a modified business jet. The analysis is part of a feasibility study to determine the suitability of mounting the antenna below the forward fuselage, or if some other location needs to be considered. The in-situ radiation patterns and the ray tracing analysis yield insight into the dominant scattering mechanisms that are most likely to degrade the operation of the array. Three areas of concern are identified: the scattering from the winglets, the scattering from the under-wing fairings, and the reflection from the fuselage.