Aircraft Code
NEWAIR Version 3.1

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A computer code written in standard Fortran 77 has been developed at The Ohio State University to investigate the radiation patterns of antennas mounted on an aircraft fuselage. Prof. Burnside originally developed the Aircraft Code. The present code (NEWAIR3) is the third version. This computer code is used to compute the near and far zone radiated fields for antennas mounted on a composite ellipsoid and in the presence of a set of flat plates. Since the NEWAIR3 code is based on the Uniform Geometrical Theory of Diffraction (UTD), the structures that can be analyzed have to be electrically large. In terms of the scattering from plate structures, this means that each plate should have edges at least a wavelength long. In terms of the composite ellipsoid structures, its major and minor radii should be at least a wavelength in extent. In addition, each antenna element should be at least a wavelength from all edges. In some cases, the wavelength limit can be reduced to a quarter of a wavelength for engineering purposes.

The code allows the user to simulate a wide variety of complex electromagnetic radiation problems using the ellipsoid/plates model. For example, the composite ellipsoid can be used to accurately simulate the fuselage of an aircraft; whereas, the plates are used to represent the wings, stabilizers, stores, engines, etc. This code can also be used to simulate the radiation of an antenna mounted directly on a ship most. In this case, the mast can be modeled by the composite ellipsoid with the other ship structures simulated by the flat plates. Note that the plates can be attached to the composite ellipsoid and/or to other plates. In fact, the plates can be connected together to form a box. Although this code can be used to simulate a wide variety of complex structures, it is specifically designed to analyze the radiation characteristics of antennas mounted on aircraft configurations.

The NEWAIR3 code has the flexibility to handle arbitrary pattern cuts in the near or far field regions. All the components of the radiated electric field are computed but only the $E\theta$ and $E\phi$ are stored in either an ASCII or binary file for later use. Note that an arbitrary antenna type can be analyzed provided the current distribution across the aperture is known. This is accomplished by approximating the distribution as a set of magnetic current elements mounted on or electric current elements mounted normal to the composite ellipsoid surface. The magnetic current elements have a cosine distribution along the magnetic current direction and a uniform distribution in the orthogonal direction. The normal electric current represents a monopole and its length can not be greater than a quarter wavelength. In the case of an antenna array, where

mutual coupling effects between the array elements are important, an intermediate calculation is necessary before the NEWAIR3 code can be used. Since the NEWAIR3 code does not take into account the coupling between array elements, it is necessary to first calculate the mutual coupling effects. This can be accomplished with a moment method code, assuming the region near the array is nearly flat (also available at The Ohio State University Electro Science Laboratory). Once the induced currents are obtained by means of a moment method analysis, they can then be taken to be part of the input data to the NEWAIR3 code.

This code has a user's manual designed to give an overall view of the operation of the computer code, to instruct the user in how to use it to model structure, and to show the validity of the code by comparing various computed results against measured data whenever available. The code is provided as a PC executable for Windows 3.x, 95, and NT or up. The possibility of other formats can be discussed with the developer. Source code is not supplied.

We follow export controls in the distribution of the NEWAIR3 code. Our policy is to only send to U. S. government agencies and U. S. companies with U. S. government contracts. In these cases, the NEWAIR3 code plus the user's manual can be obtained for a nominal fee to cover material handling costs by writing to:

> **Librarian**
> **The Ohio State University**
> **ElectroScience Laboratory**
> **1320 Kinnear Road**
> **Columbus, OH 43212-1191**

Request for the NEWAIR3 code from non-U. S. companies must be done on a government to government basis.