Executive Summary

The FAR23 loads program provides a procedure for calculating the loads on an airplane according to the Code of Federal Regulations, Title 14 – Aeronautics and Space, Chapter I – Federal Aviation Administration, Subchapter C – Aircraft, Part 23 – Airworthiness Standards: Normal, Utility, Acrobatic and Commuter Category Airplanes, Subpart C – Structures. This is referred to as CFR 14 FAR Part 23. Most of the detailed flight loads are developed from the flight envelopes specified in CFR 14 sections 23.333 and 23.345. At every point specified in the flight envelope, the airplane is balanced by a tail load reacting to the specified linear normal acceleration and the aerodynamic lift, drag, and moment about the center of gravity. The data needed to make these balancing calculations consists of weight and center of gravity, aerodynamic surface geometry, structural speeds, and aerodynamic coefficients. Modules in the FAR23 Loads program develop these data. After the data required to calculate the balancing loads are developed, the critical structural loads are determined for each component. For the critical conditions, the air loads, inertia loads, and net loads are calculated. Aileron, flap, tab, engine mount, landing, and one engine out loads are also calculated. The landing loads are calculated from the landing gear geometry, landing load factor, weight, and center of gravity data.

The FAR23 Loads program was developed by Hal. C. McMaster of Aero Science Software in the year 1989 and was updated in years 1990, 1993 and 1995. This original version of the FAR23 Loads Program was written in Q-Basic. The program could be executed on MS DOS Operating System version 3.1 or higher. The program consisted of 20 different independent modules. When the program starts, the main menu appears. After selecting a module from the main menu, the input window for that module appears which is used to specify the parameters for the analysis. The graphics programs FARPLOT and GEOMPLOT are stand-alone programs for plotting data and drawing airplane geometries. These programs read the output data from FAR23 Loads programs and graph it using a variety of options. Users can customize the graphs for use in reports. For certain modules of the program, there is more than one input form, but there is no indication as to which form the user is currently on or what data have already been entered. If the analysis is done before entering all of the data, the user may get error messages and/or incorrect outputs.

The new version of FAR23 Loads program developed at Wichita State University uses Visual Basic 6.0 and can be executed on Windows Operating System version 95 or higher. This version is a single integrated module that encompasses all the individual 20 modules. This program eliminates redundant data entry by making the data transfer process automatic, thus eliminating chances of errors due to data reentry. Data transfers from one module to another by click of a button. The program also facilitates saving, previewing and printing of all the inputs simultaneously. Although integrated, each module can be run independently by entering all required data into that module without affecting other modules. It is a complete program that does not permit the user to run a module unless valid data for that particular module have been entered. A tool tip text is provided for each field that makes it convenient for the user to input the

valid data. Saving, previewing and printing of output data for individual modules are also possible. The program also provides with additional utilities like calculator, interpolation module and unit conversion facility. Help on how to use a particular module is also made available for the user to view and print. The overall user-friendliness of the program and ease of use has greatly improved over the original version.