

# 1. Introduction

## a. About FAR23 Loads

The FAR23 Loads program was developed by Aero Science Software to calculate the loads on an airplane using methods acceptable to the FAA. The new version of program developed at Wichita State University is integrated module that uses consolidated data for the complete aircraft and performs calculations for all 20 modules independently.

Most of the detailed flight loads are developed from the flight envelopes specified in the federal requirements FARs 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 consist of (1) weight and center of gravity, (2) aerodynamic surface geometry, (3) structural speeds, and (4) aerodynamic coefficients. These data are developed by modules in the FAR23 Loads program.

After the data needed to calculate the balancing loads are developed, the critical structural loads are determined for each component. For 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.

Landing loads are calculated using landing gear geometry, landing load factor, weight, and center of gravity modules.

## b. Federal Regulations

The program FAR23 Loads 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 FAR Part23. The regulations through Amendment 42 have been included in the FAR23 Loads program.

## c. Using the Manual

This manual is a guide to run the FAR23 Loads program and is intended to be a supplement to reference 1. Reference 1 provides the theoretical development of the equations used in the computer program.

Section 2 of this manual guides the user how to install the program and run FAR23 Loads. The section also includes general information on the integrated module and its menu structure.

Sections 3 through 22 are each devoted to a separate module of the FAR23 Loads program and are organized according to the order that the modules appear in the main form of the program. Each section has up to 3 sections: description, running the module and output.

Table 1.1 is a summary of the modules in the FAR23 Loads.

**Table 1.1 Summary of Modules in the FAR23 Loads Program**

<b>Module Name</b>	<b>Section</b>	<b>Description</b>
Weight Estimation	3	Estimates weight of airplane and its components
Weight and CG	4	Calculates Weight, center of gravity, and inertia
Envelope of Loads	5	Envelope of discretionary loading
Aerodynamic Surface Geometry	6	Calculates geometric properties of 16 aerodynamic surfaces
Structural Speed	7	Determines structural design speeds
Mach Limitations	8	Determines Mach limitations
Aero Coefficients	9	Calculates aerodynamic coefficients
Air Loads	10	Calculates wing air loads
Flight Loads	11	Calculates loads within the flight envelope
Select	12	Calculates the critical flight loads
Aileron Loads	13	Calculates loads on aileron
Flap Loads	14	Calculates loads on flaps
Wing Inertia	15	Calculates spanwise inertia loads for critical wing conditions
Net Loads	16	Calculates the net wing loads
Engine Mount Loads	17	Calculates engine mount loads
Landing Loads	18	Calculates landing loads
Landing Load Factor	19	Calculates landing load factor
Tail Loads Distribution	20	Calculates the chordwise distribution for tail loads
Tab Loads	21	Calculates tab loads
One Engine Out Loads	22	Calculates loads with one engine out