**LAYUP ANALYSIS TOOL FOR MATLAB®**

**Strength Analysis and Layup Optimisation of Unidirectional Fibre-reinforced Composites**

# Analysis User’s Guide

# Version Information

**Documentation revision: 1 [08/05/2023]**

**Concurrent code release: 2.1**

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Contents

[1. Introduction 5](#_Toc134438202)

[1.1 Overview 5](#_Toc134438203)

[1.1.1 The Quick Fatigue Tool application 5](#_Toc134438204)

[1.1.2 Required user inputs 5](#_Toc134438205)

[1.1.3 Reviewing the results of a Quick Fatigue Tool analysis 5](#_Toc134438206)

[1.1.4 Checking the Quick Fatigue Tool Version 5](#_Toc134438207)

# 1. Introduction

## 1.1 Overview

### 1.1.1 The Quick Fatigue Tool application

Quick Fatigue Tool for MATLAB is a multiaxial fatigue analysis code for finite element models. It is used to calculate:

* Where and when fatigue cracks are likely to initiate;
* the factors of safety on alternating stresses; and
* the probability of survival at different service lives (the “warranty” claim curve).

The application includes:

* A general stress-based and strain-based fatigue analysis framework;
* *Material Manager*, a material database and MATLAB application which allows the user to create and store materials for fatigue analysis;
* *Export Tool*, an ODB interface which allows the user to export fatigue results to an Abaqus Output Database (*.odb*) file for visualization in SIMULIA Abaqus/Viewer; and
* supplementary analysis tools for static failure assessment.

The general analysis framework allows the user to analyse stresses from linear and nonlinear Finite Element Analysis (FEA) results. An advantage of calculating fatigue lives from FEA is that the requirement to compute stress concentration and notch sensitivity factors manually is eliminated.

### 1.1.2 Required user inputs

A Quick Fatigue Tool analysis usually requires the following inputs from the user:

1. At least one material definition
2. At least one loading definition consisting of:
   1. Stress (and strain) datasets and/or
   2. Load histories

The above input is specified by means of a *job* file. This is an M-file or text file containing a list of options that completely defines the analysis. Analyses are performed by running the job file. Basic fatigue result output is written to the command window and extensive output is written to a set of individual data files.

### 1.1.3 Reviewing the results of a Quick Fatigue Tool analysis

Information on configuring analysis output is discussed in Section 10. Results are written to an assortment of text files and figures that may be viewed in MATLAB or third-party processors.

### 1.1.4 Checking the Quick Fatigue Tool Version

The installed Quick Fatigue Tool version can be queried with the following MATLAB command:

|  |  |
| --- | --- |
| **Command Line Usage:** | >> qversion |
|  |  |

Quick Fatigue Tool uses the numbering convention *<major-release>.<minor-release>.<fix>.<revision>*.