

PRODUCT APPLICATION

Time on Wing (TOW) Evaluator

Introduction

The T700 family of turbine engines is used to power the US Army's fleet of AH-64 Apache and UH-60 Blackhawk helicopters. GE Aircraft Engines contracted Clockwork Solutions, Inc. to develop a Time On Wing (TOW) evaluation tool that can be used to calculate TOW given different population definitions like engine part number, repair processes (e.g. Recapitalization), location of operation, repair location, and removal interval. Results are generated as a function of time. The TOW Evaluator also allows the selection of starting date, ending date, time interval, causal failure code definition (true failures), and method of TOW calculation. The tool was built as a standalone application that accepts US Army Aviation Maintenance Management (TAMMS) data according to DA PAM-2410 (Army Component Removal and Repair/Overhaul Records), platform location and usage records as input to generate and display TOW outputs.



Requirements

The TOW Evaluator was developed to address the following GE requirements:

- A user friendly data analysis tool that standardizes the TOW calculation and reduces calculation time.
- Allow the user to define how TOW should be calculated.
- Allow the user to define populations for comparing TOW over a selected time range.
- Sanitize the source 2410 database before calculating TOW using duplicate and missing records logic.
- Provide a process so that inputs to the TOW Evaluator can be updated on a quarterly basis.
- Provide technology with users guide and associated user training.

Use the TOW Evaluator to generate statistical failure rates as input into the **ATLAST / T700™** engine forecasting model.

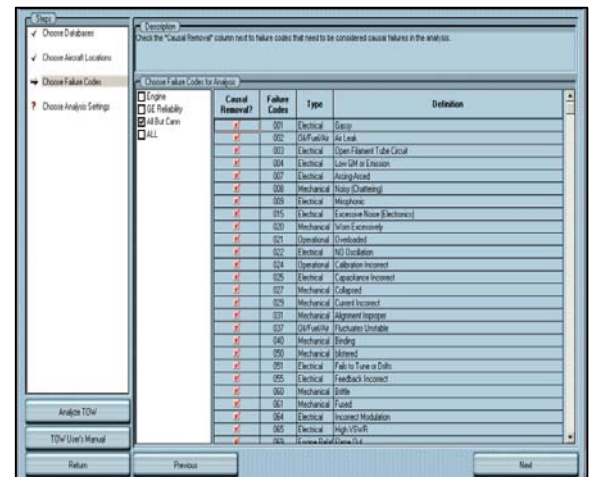


Figure 1: Input Screen allowing User to Define the Meaning of Failure

Benefits

- Standardization of the TOW calculation process for all GE T700 Series Engines, including the T700, T701, T701C, and T701D.
- Reduction of calculation time: Automating the TOW calculation process allows GE AE to get immediate, updated TOW results every month, quarter, or year.
- Advanced output to include a TOW Weibull plot with a bar chart identifying those engines still flying (in suspension).
- Ease-of-use: The tool walks the user through each step of TOW and population definition using a wizard design.
- Flexible Population Definition: The tool has many TOW definition options, including the separation of populations into deployed and non-deployed locations to assess the impact of war conditions on engine performance.
- Flexible Design of the TOW Evaluator allows continuing development due to changing customer requirements.

Primary Functionality

- Population Definition: allows the user to choose how the entire T700 population of engines should be categorized:
 - Part Number: includes T700, T701, T701C, and T701D.
 - Repair Process: can further categorize part number by whether or not a repair to a new standard has occurred.
 - Removal Interval: defines what removal interval (or all) should be used in generating/viewing TOW output (1st, 2nd, 3rd, etc. after start date).
 - Repair Location: defines populations into “Repair at Depot”, “Repair at Non-Depot”, or “Repair at all locations” category.
 - Location of Operation: defines populations by the platform location, according to locations available in the platform location history. (e.g., Southwest Asia vs. Non Southwest Asia)
- TOW Calculation Definition: allows user to select how TOW should be calculated for each defined population:
 - From Date, To Date, Time Interval: TOW can be defined from any date, to any date, and then by month, quarter, or year.
 - Failure Code Definition: can define the meaning of failure for the TOW calculation, given a list of failure codes. (e.g., this allows the user to calculate TOW for all failures, reliability-based failures only, etc.)
 - TOW calculation method: user can select either the Simple Mean method or the Weibull Maximum Likelihood Estimation method for fitting the final TOW data set to a representative statistical distribution. Weibull parameters like shape, scale, mean, standard deviation, B1, B10, B50, and B90 are provided as outputs.

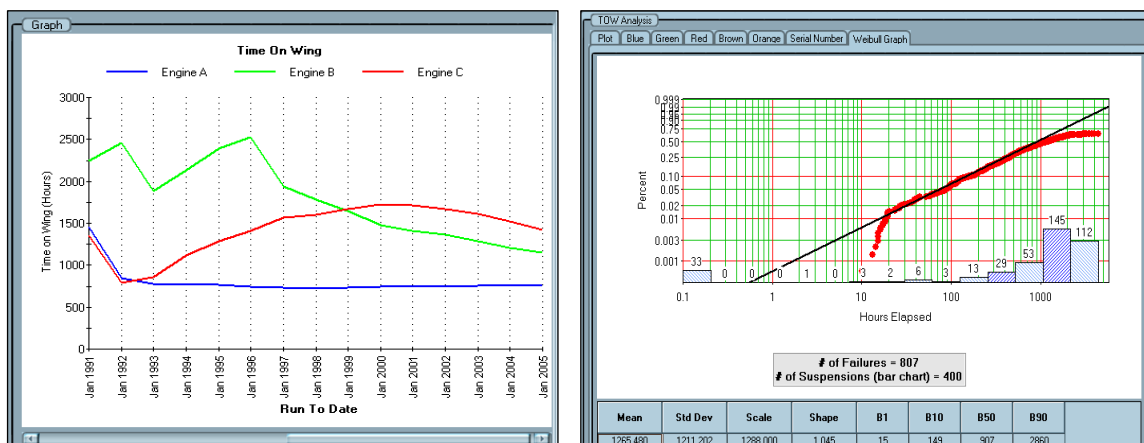


Figure 2: Outputs provide a view in a time-dependent graph, chart, or an advanced Weibull plot with suspension quantities identified in a bar chart.

Contact: Email: info@clockwork-solutions.com

Website: www.clockwork-solutions.com