Introduction to Probabilistic Safe Life Analysis and Probabilistic Damage Tolerance Analysis Using the FAA-Sponsored SMART Software with Hands-on Training

Course Details:

This 4-hour training class is divided into two sections:

The first section aims to provide attendees with one hour overview of the basic methods to compute aircraft fleet life distribution, the hazard function, and sensitivity analysis using the safe-life analysis method.

The second section aims to provide attendees with three hour overview of the probabilistic damage tolerance methods to compute the single flight probability of failure, cumulative total probability of failure, and the hazard function, with and without inspections.

This training will describe in detail the methodology utilized in the SMART computer software. This training will include examples using MS Excel and comparisons with the SMART results to perform probabilistic risk assessment of aircraft fleets. SMART uses a probabilistic methodology that can assess a large range of random variables, define inspection actions, and calculate the extreme value distribution of maximum load per flight from an internally generated spectrum. This class will familiarize the attendees with the SMART Software. Users will have the option to download and run the SMART software during the course.

Topics will include:

- Safe-Life Random variables (e.g. Miner's Rule damage factor, fatigue S-N, spectrum)
- Probabilistic Spectrum Generation
- Probabilistic Safe life analysis using Miner's Rule
- Basic sensitivity analysis (e.g. Pearson coefficient, scatter plots)
- Fleet management using the hazard function
- PDTA Random variables (e.g. initial flaw size, da/dN, residual strength, geometry, spectrum)
- Extreme Value Distribution Modeling
- Probability of Failure Calculations
- Inspections and Repairs, including probabilistic POD
- External Crack growth software link
- Application Example problems

Instructor and Biography

Juan Ocampo, Ph.D., is an Assistant Professor of Mechanical Engineering in the St. Mary's University, San Antonio, Texas, Engineering Department.

Ocampo received his Ph.D. in Mechanical Engineering from the University of Texas at San Antonio (UTSA) in 2013. He also received his M.S in Mechanical Engineering from UTSA in 2009. He came to the United States from Medellin, Colombia, where he received his B.S. degree in Mechanical Engineering from EAFIT University.

Ocampo's main research area is Holistic Structural Integrity Process (HOLSIP) with an emphasis on structural integrity (probabilistic fatigue and damage tolerance analysis). He has active research grants with the Federal Aviation Administration in structural integrity.

Ocampo also performs consulting activities for the industry, where for example he supported the development of the Pilatus PC-24 business jet. Ocampo is very active in the structural integrity and aging aircraft community where he frequently presents and publishes his work at different national and international conferences.