

**Basic: August 13 - 15, 2018**  
**Advanced: August 16 - 17, 2018**  
**Gainey Suites Hotel**

7300 E Gainey Suites Dr. Scottsdale, AZ 85258

ZAERO integrates all essential disciplines required for advanced industrial aeroelastic design and analysis. During training, engineers will learn to apply ZAERO in the areas of Static/Dynamic Loads, Flutter, and Aeroservoelasticity (ASE). The course provides an introduction to the software, theoretical background, and capabilities. It also presents detailed information regarding modeling guidelines and how to make best use of ZAERO's strengths.

### **BASIC TOPICS**

#### **DAY ONE**

- About ZAERO
- Main Features of ZAERO
- Theory Behind ZAERO
- ZONA6, ZONA7, ZTRAN, ZTAW, and ZONA7U
- Aerodynamic Modeling Guidelines
- High Fidelity Wing and Body Modeling
- Spline
- Beam Spline, Surface Spline, 3D Spline
- AIC Matrix Generation
- Issues on High Reduced Frequencies

#### **DAY TWO**

- Static Aeroelastic Analysis
- Theoretical Background
- Modal Approach
- Trim Analysis
- Over-Determined Trim Analysis
- Flutter Analysis
- Methods for Flutter Analysis (*K-, p-k, and g-methods*)
- Parametric Flutter Analysis
- Guidelines for Flutter Analysis
- Mass Increment Method for Massive Aircraft/ Store Configurations
- Asymmetric Store Configurations using Half Span Model

#### **DAY THREE**

- ZAERO Hands-On Training (*Laptop Required*)

### **ADVANCED TOPICS**

#### **DAY ONE**

- State-Space ASE Modeling and Analysis
- Theoretical Background
- Rational Function Approximation
- Roger's Method
- Minimum State Method
- State-Space Aeroelastic Modeling
- Actuator and Sensor Modeling
- ASE Plant Model
- ASE Vehicle and Closed-Loop System Models
- Time Domain ASE Modeling and Stability Analysis
- Frequency Domain ASE Modeling and Stability Analysis

#### **DAY TWO**

- Dynamic Response to Gust
- State-Space Formulation with Gust
- Discrete Gust Response
- Frequency Domain Formulation
- Time Domain Formulation
- Hybrid Approach
- Continuous Gust Response
- Frequency Domain Formulation
- Time Domain Formulation
- Loads Recovering Methods
- Mode Displacement (MD) Method
- Summation of Force (SOF) Method
- Nonlinear Flutter Analysis
- Formulation of Equation
- Issues of Modal Approach



**ZONA TECHNOLOGY**

## **ZAERO Basic Training Schedule**

**Gainey Suites Hotel**  
**Room: Gainey C**

### **DAY 1 – MONDAY, AUGUST 13**

9:00 am - Welcome Check-In  
9:30 am - ZAERO Overview  
9:50 am - ZAERO Input Data Structure  
10:30 am - Break  
10:40 am - Aeroelasticity in ZAERO  
11:10 am - AIC Matrix Generation  
**12:00 pm - Lunch Break in Hearth Room**  
1:00 pm - Aerodynamic Modeling Guidelines  
3:30 pm - Break  
3:40 pm - Aerodynamic Modeling Guidelines  
(continued)  
4:30 pm - Question & Answer  
5:00 pm - Class Dismissed

### **DAY 2 – TUESDAY, AUGUST 14**

9:00 am - Spline Module  
10:30 am - Break  
10:40 am - Flutter Solution Methods  
11:15 am - Flutter Bulk Data Card Input  
**12:00 pm - Lunch Break in Hearth Room**  
1:00 pm - Guidelines for Flutter Analysis  
1:30 pm - Parametric Flutter Analysis  
2:30 pm - Static Aeroelastic Analysis: Theoretical  
Background, & Modal Analysis  
3:30 pm - Break  
3:40 pm - Static Aeroelastic Analysis: Trim Analysis, &  
Bulk Data Card Input  
4:30 pm - Question & Answer  
5:00 pm - Class Dismissed

### **DAY 3 – WEDNESDAY, AUGUST 15**

9:00 am - ZAERO Hands-On: Aerodynamic Modeling  
10:30 am - Break  
10:40 am - ZAERO Hands-On: Flutter Analysis  
11:10 am - ZAERO Hands-On: TRIM Analysis  
**12:00 pm - Lunch Break in Hearth Room**  
1:00 pm – Hands-On Continues  
3:30 pm - Break  
3:40 pm - Question & Answer  
4:30 pm - Class Dismissed



## **ZAERO Advanced Training Schedule**

**Gainey Suites Hotel**  
**Room: Gainey C**

### **DAY 1 – THURSDAY, AUGUST 16**

- 9:00 am - Welcome Check-In
- 9:10 am - Theoretical Background of ASE
- 10:30 am - Break
- 11:10 am - Theoretical Background of ASE (continued)
- 12:00 pm - Lunch Break in Hearth Room**
- 1:00 pm - Bulk Data Input for Open-Loop ASE Analysis
- 3:30 pm - Break
- 3:40 pm - Bulk Data Input for Closed-Loop ASE Analysis
- 4:40 pm - Question & Answer
- 5:00 pm - Class Dismissed

### **DAY 2 – FRIDAY, AUGUST 17**

- 9:00 am - ASE Models for Gust Response Analysis
- 10:00 am - Frequency Domain Discrete Gust Analysis
- 11:00 am - Break
- 11:10 am - State-Space and Hybrid State-Space Discrete Gust Analysis
- 12:00 pm - Lunch Break in Hearth Room**
- 1:00 pm - Frequency & Time-Domain Continuous Gust Analysis
- 2:30 pm - Loads Recovering Methods
- 3:30 pm - Break
- 3:40 pm - Nonlinear Flutter Analysis
- 4:40 pm - Question & Answer
- 5:00 pm - Class Dismissed



**ZONA TECHNOLOGY**