



OpenVSP Ground School Overview

2020 OpenVSP Workshop, Virtual Broadcast

September 15-17, 2020

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OpenVSP Ground School



OpenVSP is accessible and intuitive to even novice users in basic operations but contains extraordinary depth and subtleties that can take years to master.

- Consistent demand for comprehensive, multi-format, easily updated tutorials or manual.
- Written document requires more time and effort than is available from OpenVSP administrators or power-users.

Determined that an online training program was the best option.

- Advocation for program development to OpenVSP leadership and NASA TTT.
- Generated content map, tested website pages, created basic videos, and implemented HTML modifications in early stages.
- Worked with LaRC Sites Support to find a website format that was responsive, clear, accessible, and robust. WordPress Twenty-Fifteen template works very well.

Content generation and editing proceeding better than expected.

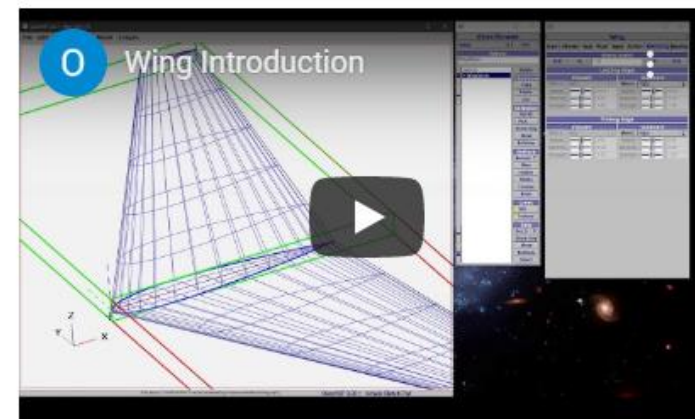
- 67 tutorial pages created with introduction and video.
- Over 140 tutorials expected at present count for Chapter 1 topics alone.
- Ground School feedback has been excellent and community outreach has increased.



Wing Introduction

Introduction

The Wing is one of the most versatile and fundamental components in OpenVSP. This video will introduce the Wing component and the various parameters that control the geometry.



Program Vision



- Formalized training program taking users from no prior use through advanced methods and techniques.
- Format should be of the form:
 - **Chapter**
 - Subject
 - Topic
 - Lecture (with audio version)
 - Describes the topic including the purpose, features, and best practices as needed.
 - Length depends on the topic but should not exceed appx. 2 mins.
 - Demonstration with video (if applicable)
 - Recorded demo of step-by-step walkthrough with audio.
 - Each topic should be less than 5 mins. If you can't get the material into that time, break up the topic.
 - Procedure (if applicable)
 - Break procedure into tasks
 - List/describe each step in each task through completion of the topic.
- Exercises are performed after groups of topics or at the end of a subject to reinforce learning.
 - We provide example files with components **already in place** to perform the required actions.
 - Shall not require additional set up to perform exercises.
 - Files are distributed in a single zipped folder, organized by Chapter\Subject\Topic.

Content Structure (Draft)



1. Chapter, a. Subject, i. Topic

1. OpenVSP Fundamentals

- a. Getting Started
- b. Intro to the Basic Modeling Process
- c. Concepts
- d. Interface
- e. Wings
- f. Fuselages
- g. Stacks
- h. Pods
- i. Ellipsoids
- j. Bodies of Revolution
- k. Propellers
- l. Blanks
- m. Hinges
- n. Conformal Bodies
- o. Cross-Section Details
- p. Skinning
- q. Modifying Airfoils

2. Modeling and Designing Intent

- a. Sets
- b. Design Variables

- c. Variable Presets
- d. Measure
- e. User Parameters
- f. Snap To
- g. Fit Model
- h. Linking Parameters
- i. Advanced Parameter Linking
- j. Subsurfaces

3. Analyses

- a. CompGeom
- b. Planar Slice
- c. Mass Prop
- d. Projected Area
- e. Surface Intersection
- f. CFD Mesh
- g. FEA Mesh
- h. DegenGeom
- i. VSPAERO
 - i. GUI
 - ii. Command Line
 - iii. Viewer
 - iv. Results Mgr

- j. Wave Drag
- k. Parasite Drag

4. Working with Other Programs

- a. Importing Files from Other Programs
 - i. Cover all formats
- b. Exporting Files to Other Programs
 - i. Cover all formats
- c. Operating VSP from the Command Line
- d. Operating VSP from Python
- e. Wrapping VSP into system modeling environments

5. Advanced Modeling Methods

- a. Scripting
- b. Custom Components
- c. Creating airfoils

Content Structure (Draft)



1. Chapter, a. Subject, i. Topic

1. OpenVSP Fundamentals

a. Getting Started

- i. Introduction to OpenVSP and the training library
- ii. Using the library
- iii. Location of Training Files

b. Intro to the Basic Modeling Process

- i. Basic Modeling Process

c. Concepts

- i. Modeling solids and surfaces
- ii. Parametric modeling
- iii. *Attachment? w/ Parametric discussion?*

d. Interface

- i. Main window
- ii. Working with files
 - a. Include description of the browser window and command language used
- iii. Adjusting the window
- iv. Changing the background
- v. Standard views
- vi. Changing the view reference
- vii. Setting custom views
- viii. Adjusting the current view
- ix. Working in the Geometry Browser
- x. Component general information
- xi. Component transformation, symmetry, and attachment

e. Wings

- i. Creating a wing
- ii. Wing sections and planform
- iii. Airfoils
- iv. Blended wings

f. Fuselages

- i. Creating a fuselage
- ii. Cross-Section Control
- iii. Fuselage Design Policy

g. Stacks

- i. Creating a stack
- ii. Cross-Section control
- iii. Stack design policy

h. Pods

- i. Creating a pod

i. Ellipsoids

- i. Creating an ellipsoid

j. Bodies of Revolution

- i. Creating a BoR
- ii. Cross-section control

k. Propellers

- i. Creating a propeller
- ii. Cross-section control
- iii. Blade control curves
- iv. Folding

l. Blanks

- i. Creating a blank
- ii. Using blanks as point masses
- iii. Using blanks as references (on and off of surfaces)
- iv. Combining blanks for transformations

m. Hinges

- i. Creating a hinge
- ii. Setting hinge orientation
- iii. Controlling hinge motion

n. Conformal Bodies

- i. Creating a conformal body

o. Cross-Section Details

- i. Point
- ii. Circle
- iii. Ellipse
- iv. Super Ellipse
- v. Rounded Rectangle
- vi. General Fuselage Section
- vii. Fuselage Section File
- viii. NACA 4-Series
- ix. NACA 6-Series
- x. Biconvex
- xi. Wedge
- xii. Bezier
- xiii. Airfoil File
- xiv. CST Airfoils
- xv. Karman-Trefftz Foils
- xvi. NACA 4-series Mod
- xvii. NACA 5-series
- xviii. NACA 5-series Mod
- xix. NACA 16-series

p. Skinning

- i. Angles and Strengths
- ii. Symmetry and Continuity

q. Modifying Airfoils

- i. Shift, Rotate, and Scale
- ii. Closure
- iii. Trim

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- vi. General Fuselage Section
- vii. Fuselage Section File

Over 140 topics in Chapter 1 alone.

Each topic generally has a lecture, video tutorial, and procedure.
Exercises at the end of relevant material.

In short... this task is *massive*.

- ii. Using blanks as point masses
- iii. Using blanks as references (on and off of surfaces)
- iv. Combining blanks for transformations

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- i. Creating a hinge
- ii. Setting hinge orientation
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Leveraging Existing Content



- If feasible, don't repeat work.
 - The training program is not intended to replace all VSP documentation. This is a How-To with explanations of concepts as needed.
 - Much of the Wiki content simply needs to be refreshed, not redone from scratch. Justin Gravett [ESAero] and others have already updated and improved the Wiki.
- Some overlap is expected to provide context or detailed guidance of advanced concepts.
- Existing resources such as the VSP YouTube channel, Google Group, Hangar, etc. shall be linked directly from the training.

VSP Ground School Features



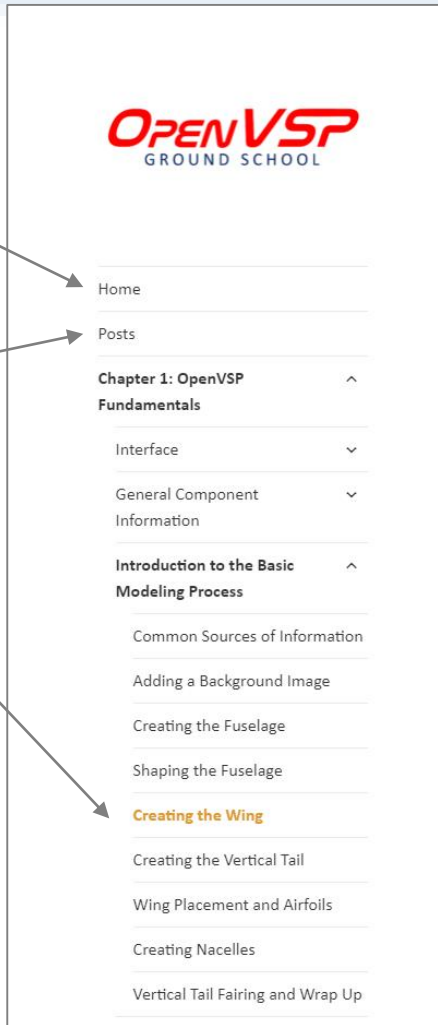
Landing page for easy navigation

Posts for notifications of important content or events

Interactive menu showing current position

Contact form to provide feedback or ask questions.

Example model files.



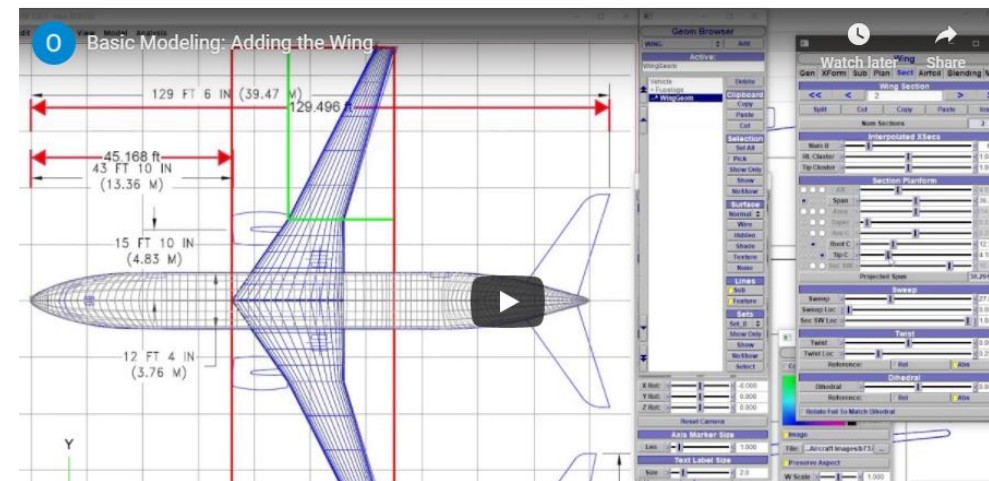
SEARCH CONTENT

Search ...

Creating the Wing

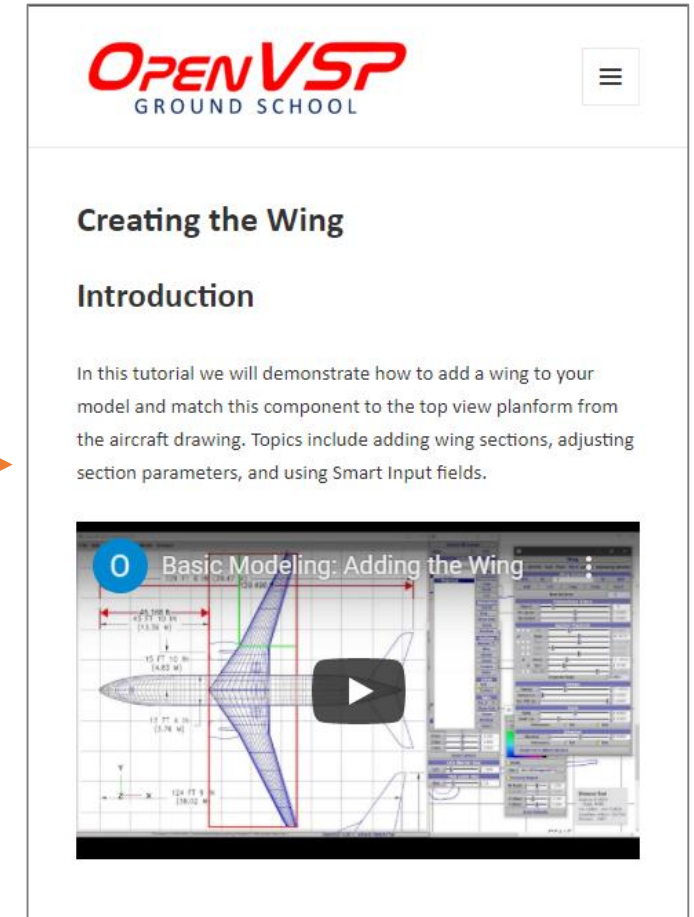
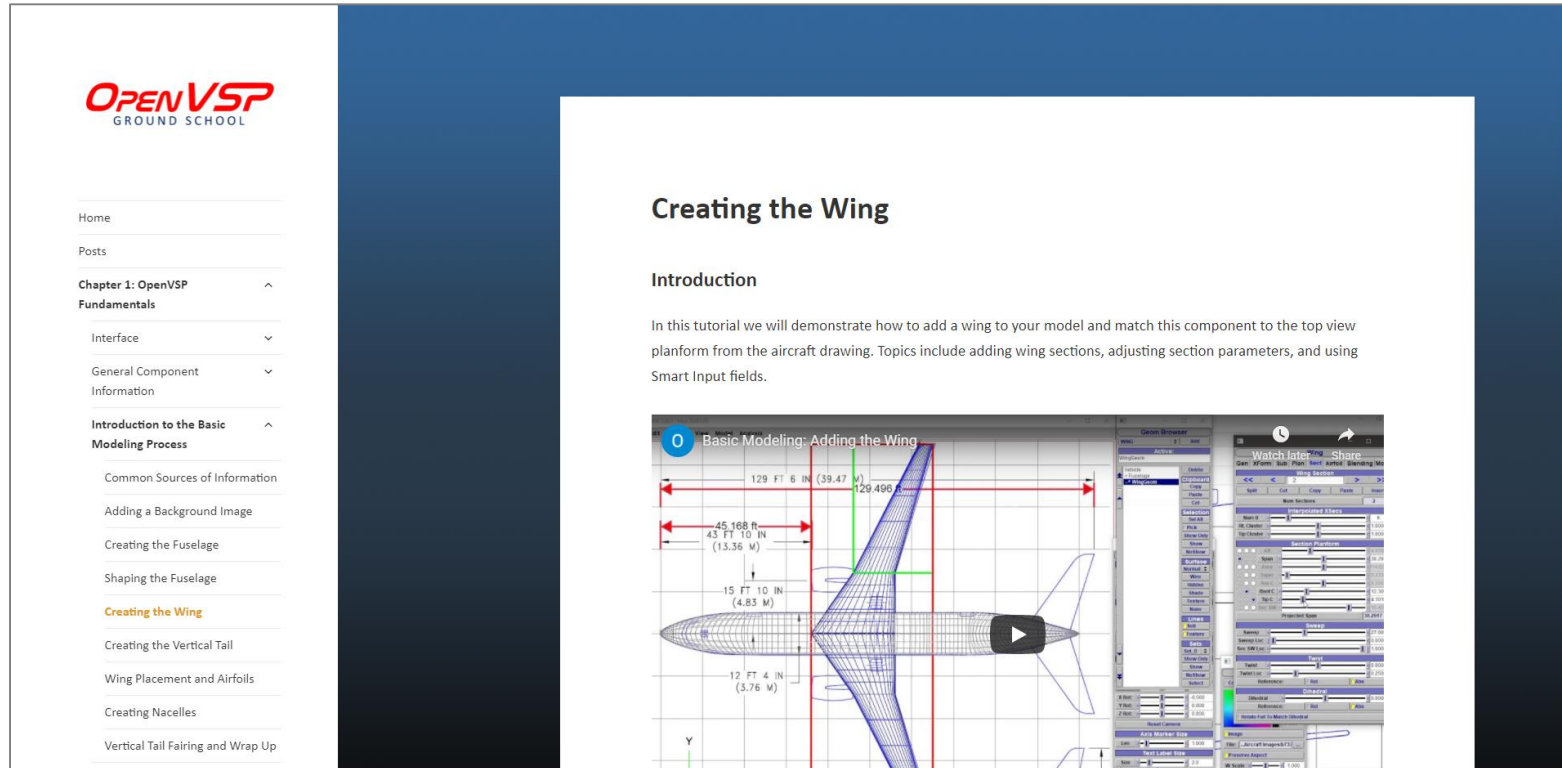
Introduction

In this tutorial we will demonstrate how to add a wing to your model and match this component to the top view planform from the aircraft drawing. Topics include adding wing sections, adjusting section parameters, and using Smart Input fields.



Entire site is searchable by keyword, topic, or category. Quickly find what you need.

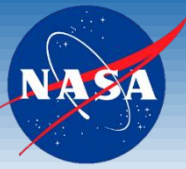
VSP Ground School Features



Responsive pages work with monitors, tablets, and smartphones.

Active commands prevent the 'Long Press' issue with mobile devices.

Coming Soon...



- Near Term:
 - Fixing subscription service notifications.
 - Wrapping up Chapter 1 material.
- Next Year:
 - Increased production of content for Chapters 2 through 5.
 - Heavy focus on analyses and design intent.
 - Written procedures for topics.
 - Practice exercises.

Demonstration



- Walkthrough of website features.
 - <https://vspu.larc.nasa.gov>

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Thank you!

Questions?

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