

## List of Figures

<b>Figure</b>	<b>Page</b>
1.1 Flow chart for multidisciplinary analysis and design .....	15
1.2 Aerodynamic shape sensitivity analysis and optimization loop.....	16
1.3 Static aeroelastic analysis loop.....	17
4.1 Discretization for aerodynamic and structural models.....	53
5.1 Bezier-Bernstien curve parameterization.....	59
5.2 Wing planform parameterization.....	59
6.1 NACA-0012 surface parameterization and unstructured mesh.....	77
6.2 Grid sensitivity comparison for the NACA-0012 airfoil.....	78
6.3 NACA-0012 and final optimized airfoil surfaces.....	79
6.4 Pressure coefficient distributions for the initial and optimized airfoil surfaces.....	80
6.5 Pressure contours about the NACA-0012 airfoil.....	81
6.6 Pressure contours about the final optimized airfoil surfaces .....	82
6.7 Pressure coefficient distributions for the reformulated design problem.....	83
6.8 Multielement airfoil mesh, vane parameterization, and grid sensitivities .....	84
6.9 Pressure contours and sensitivity of pressure for the mutlielement airfoil.....	85
6.10 Initial and optimized vane and pressure coefficient distributions.....	86
6.11 Unstructured mesh and grid sensitivity comparison for the rectangular wing.....	87
6.12 Pressure contours and sensitivity of pressure for the rectangular wing (1 <sup>st</sup> - )....	88
6.13 Pressure contours and sensitivity of pressure for the rectangular wing (2 <sup>nd</sup> - )...89	89

6.14	Initial and final optimized wing planforms.....	90
6.15	Boeing 747-200 surface mesh and grid sensitivity .....	91
6.16	Optimization results for the Boeing 747-200 wing redesign.....	92
6.17	Initial and final Boeing 747-200 upper surface pressure contours.....	93
6.18	Initial and final Boeing 747-200 lower surface pressure contours.....	94
6.19	Influence of aerodynamic and structural interaction control parameters.....	95
6.20	Aerodynamic and structural analysis interaction histories ( $M = 0.30$ ).....	96
6.21	Aerodynamic and structural analysis interaction histories ( $M = 0.70$ ).....	97
6.22	Aerodynamic and structural analysis interaction histories ( $M = 0.85$ ).....	98
6.23	Aerodynamic and structural analysis interaction histories ( $M = 1.20$ ).....	99
6.24	Aeroelastic wing deflections across the Mach number regime.....	100
	Concluded .....	101
C.1	Typical unstructured grid tetrahedral cell.....	134