Table 6.4: Comparison of quasi-analytically computed sensitivity derivatives, $\frac{d(L/D)}{d\beta_k}$, with finite-difference for the wing-planform optimization.

	First-Order Spatial Accuracy		Higher-Order Spatial Accuracy	
Design Variable	Central Finite-Difference	Quasi-Analytic	Central Finite-Difference	Quasi-Analytic
β_1	-0.3318338	-0.3318332	-2.59768	-2.59759
β_2	-0.7733643	-0.7733647	-3.08299	-3.08223
β_3	-0.3445127	-0.3445124	-2.00547	-2.00540
β_4	0.4175189	0.4175191	0.358621	0.358618
β_5	-0.0795680	-0.0795678	-2.68639	-2.68643
β_6	-0.2453244	-0.2453241	-2.35349	-2.35354

Table 6.5: Summary of the wing-planform optimization results.

Spatial Accuracy	$(L/D)^I$	$(L/D)^F$	Function Evaluations	Gradient Evaluations	CPU [Y-MP hr]	Memory[A] [words/cell/DV]
First-Order	3.0889	3.5619	113	12	4.8	14.6
Higher-Order	16.1810	18.4128	87	10	12.6	15.6

I ≡ Initial
F ≡ Final Optimized
A ≡ Additional memory to CFD solver
DV ≡ Design variable

Table 6.6: Summary of the Boeing 747-200 optimization results.

Initial Objective	Final Objective	Function Evaluations	Gradient Evaluations	Memory† [MW]	CPU Y/MP‡ [hr]
14.136	14.522	24	3*	63.3/104.1	3.7/23.4

* Stopped after third design cycle.
† Memory for CFD analysis/memory for sensitivity analysis.
‡ CPU time for converged CFD analysis/total optimization run time.