

Airbus A380



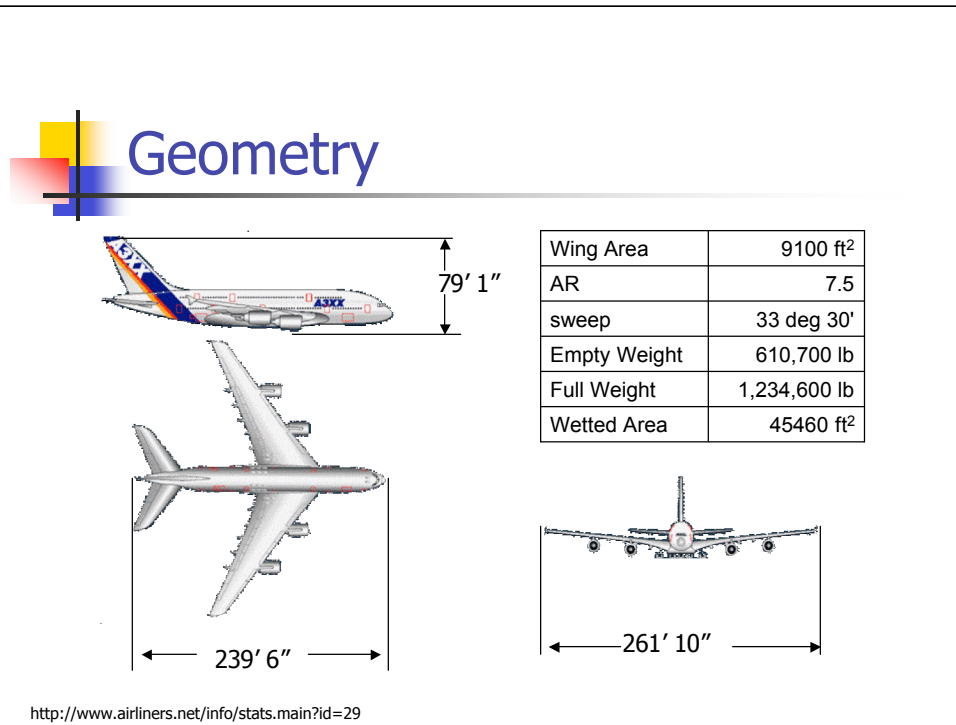
http://news.bbc.co.uk/2/hi/in_pictures/4183707.stm

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References:

<http://www.airliners.net/info/stats.main?id=29>
<http://www.aerospace-technology.com/projects/a380/>
http://en.wikipedia.org/wiki/Airbus_A380
Jane's All the worlds Aircraft
<http://www.aerospaceweb.org/aircraft/jetliner/a380/index.shtml>
http://www.aoe.vt.edu/~mason/Mason_f/A380Collins.pdf
http://www.aoe.vt.edu/~mason/Mason_f/A380Weisman.pdf
<http://www.airliners.net/info/stats.main?id=27>



Geometry and basic information was from <http://www.airliners.net/info/stats.main?id=29> as well as from Jane's All the World's Aircraft. The wetted area calculation was made using estimates from aircraft diagrams in Jane's.

Component Title	Swet (Ft2)	Refl(ft)	Tc	Icode	Frm	Fctr	Ftrans
Fuselage	14640.0000	253.100	0.104	1	1.0580	0.0000	
Wing	20896.8008	65.500	0.122	0	1.2307	0.0000	
Vertical Tail	3192.2000	43.600	0.083	0	1.1510	0.0000	
Engine	2955.0000	19.400	0.625	1	3.4501	0.0000	
Horizontal Tail	3776.0000	29.100	0.124	0	1.2344	0.0000	



Other Information

Span "e"	0.8689
C_{D0}	0.0121
L/D_{max}	20.6
Neutral Point	115.2 ft = 48.1% chord
Minimum C_D	0.0358
Estimated cg	101.05 ft = 42.2% chord
Static Margin	14.15 ft = 5.9% chord
Cruise C_L	0.901

Penalties for scaled down span:

- scaled off the wing area and wing span, the A380 should have a span of almost 460 ft
- Actual wing span is almost 262 ft, meaning a loss of 197 ft
- Actual wing is only 57% of the span of the desired wing

Data was calculated from:

LAMDES – span "e," minimum C_D , cruise C_L

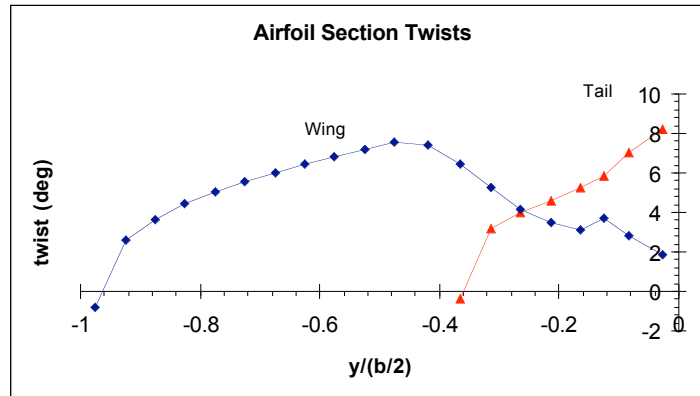
VLMpc – neutral point

FRICION – C_{D0}

Hand calculated – L/D_{max} , estimated cg, estimated static margin

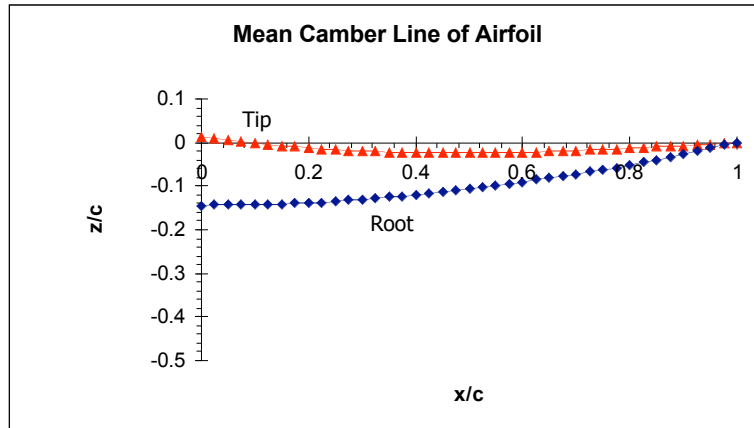
Penalties – calculations were based on a wing area of 9095 ft² for the A380, and of 3908.4 ft² for the A340-200. The span of the A340-200 was listed as 197.0 ft

Twist Distribution



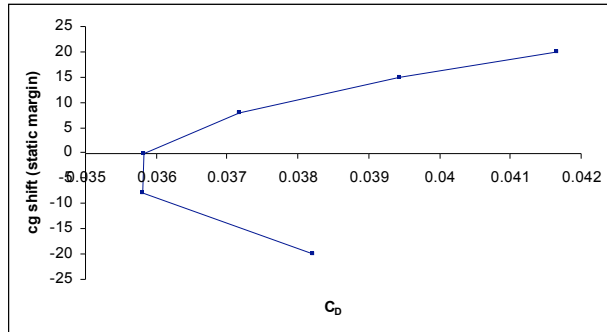
Airfoil Twist Distribution was obtained using LAMDES. Only wings and horizontal tails were modeled (fuselage was excluded). The center of gravity was assumed to be the estimated cg of 101.05 ft, or roughly 42% chord length for the output.

Root/Tip Changes



Information was calculated using LAMDES, and data was taken for the span wise stations closest to the tip and the root (actual stations are roughly 3.5% of the half span distance from the targeted location, relating to about 3.5 feet away)

Center of Gravity



This shows that there is very little change in the center of gravity as a function of the change in drag coefficient

A change of 62 drag counts is needed to change the static margin 20 ft = 8.35% chord
1 drag count = 0.135% change in static margin

Data was calculated by changing the location of the center of gravity and looking at the changes in the drag output. Because the neutral point is assumed to remain constant, the change in the cg is also the change in the static margin. The data was then plotted as a function of the change in the drag, and it is shown that 62 counts of drag are necessary to move the static margin 8.35%.

Each drag count can be attributed to a 0.135% change in the static margin



Transonic Airfoil

- Used a modified Whitcomb SC airfoil
 - Closely matched Megaliner design
- $C_{L\text{Critical}} = 0.58$
 - At Mach 0.6
 - Above this Mach Number TSfoil exploded