AIRCRAFT SURFACE GENERATION

Results of EC Brite/Euram Project 'Euromesh'

1990-92

H. Sobieczky
DLR Göttingen

Additional illustrations of article in
Notes on Numerical Fluid Mechanics, Vol. 44, pp.71 - 76, ed. N. Weatherill et al, Vieweg (1993)

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GEOMETRY GENERATOR:

PREPROCESSOR SOFTWARE FOR APPLIED AERODYNAMICS

INPUT	WORK TOPICS	OUTPUT
BASIC PHENOMENA MATHEMATICAL MODELLING	GEOMETRIES WITH FLOW PHENOMENA CONTROL PARAMETERS	INVERSE DESIGN AND OPTIMIZATION STRATEGIES
NUMERICAL METHODS	GRIDS FOR HIGH RESOLUTION CFD ANALYSIS	TEST CASE DEFINITION FOR CFD AND EXPERIMENT
	ZONAL METHODS FOR FAST FLOW SOLVERS	APPLIED CASE STUDIES AND TOOLS FOR THE INDUSTRY
	FLOW ELEMENTS CONSTRUCTION FOR AERODYNAMIC DESIGN CONCEPTS	
COMPUTER SCIENCE TOOLS	INTELLIGENT SYSTEMS	AERODYNAMICS ON WORKSTATIONS AND PC's

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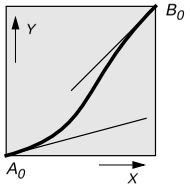
FUNCTIONS AND CURVES



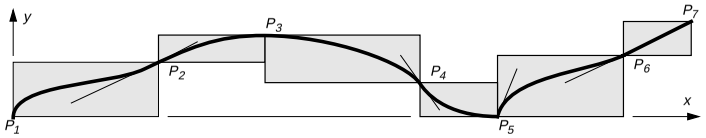
1. Functions in Non-dimensional 2D plane (X, Y); Connecting Function between 2 Points in Unit Square:

Start A_0(0., 0.): Tangent, Curvature or Power
End B_0(1., 1.): Tangent, Curvature or Power

Function Type Choice
Polynomials, Algebraics, Trigon., Exponentials,.....

Example: (tangents and curvature control)
$Y = a_n X^n$, n = 1,5 (Quintic)

2. Modelling arbitrary curves in 2D space (x, y) by dimensioned unit functions:
Given: Supports P_n (x, y), Tangents and other Parameters.



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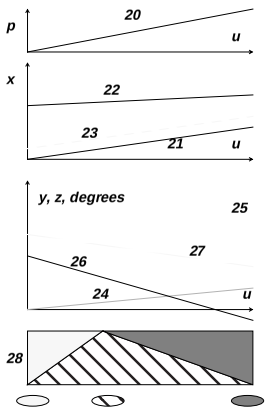
WING PARAMETERS

Characteristic Shape Parameters.
Example: Wing Geometry

key #	Function	
20	wing span station	u(p), p = p(η)
21	leading edge coo.	$x_L(u)$
22	trailing edge	$x_T(u)$
23	twist axis	$x_D(u)$
24	twist axis	$z_D(u)$
25	twist axis	$y_D(u)$
26	twist in degrees	$\alpha(u)$
27	airfoil thickness fac.	$\tau(u)$
28	airfoil distribution	$\sigma(u)$



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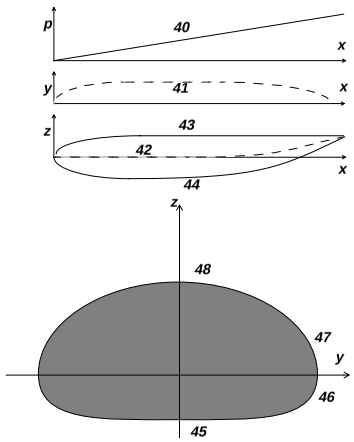
BODY PARAMETERS (1)

Characteristic Shape Parameters.
Example: Body Geometry

key #	Function	
40	cross sec. station	x(p), p = p(n)
41	body planform	$y_M(x)$
42	body planform	$z_M(x)$
43	upper crown line	$z_U(x)$
44	lower crown line	$z_L(x)$
45	cross sec. exp. 1	$e_1(x)$
46	cross sec. exp. 2	$e_2(x)$
47	cross sec. exp. 3	$e_3(x)$
48	cross sec. exp. 4	$e_4(x)$



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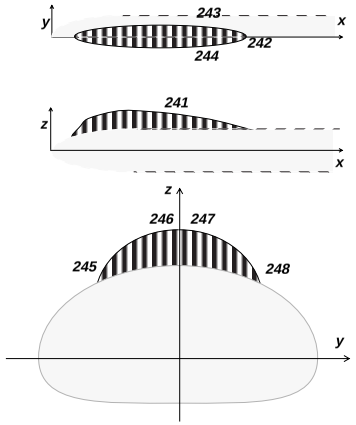
BODY PARAMETERS (2)

Characteristic Shape Parameters.
Example: Body vertical bumps (240, 340,..)

key #	Function	
240	bump yes/no switch	j(x), x = x(n)
241	bump height	$z_{MB}(x)$
242	bump crest line	$y_{MB}(x)$
243	upper bump bdy.	$y_{UB}(x)$
244	lower bump bdy.	$y_{LB}(x)$
245	bump sec. exp. 1	$e_{1B}(x)$
246	bump sec. exp. 2	$e_{2B}(x)$
247	bump sec. exp. 3	$e_{3B}(x)$
248	bump sec. exp. 4	$e_{4B}(x)$



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COMPONENT JUNCTION

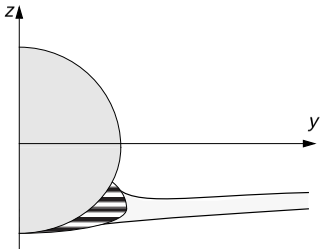
Fuselage surface Generation,
Fillet Shaping and
Wing Root Fairing

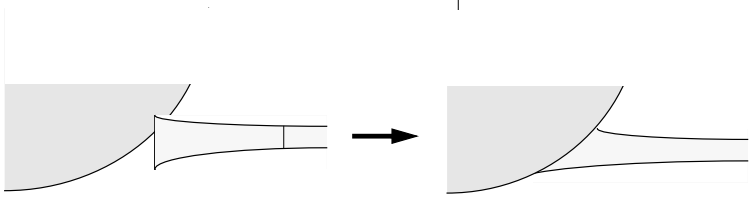
Spanwise coordinate definition y(x,z)

Modified Superelliptic Quarter Sections

Additional Bump Option

Blended Wing Projection toward Surface





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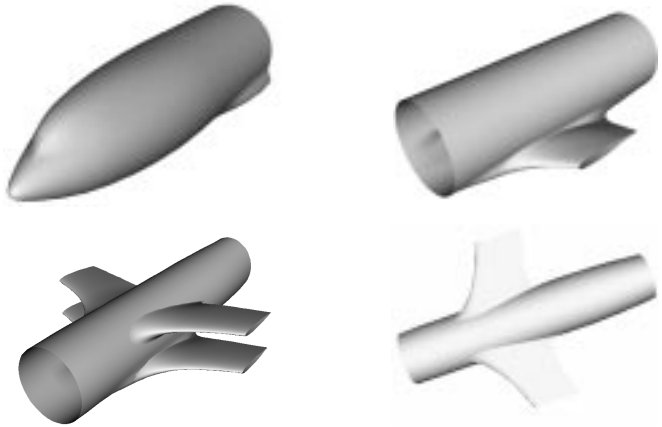
ILLUSTRATIONS



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