

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)



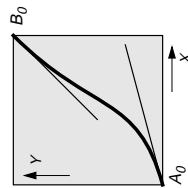
FUNCTIONS AND CURVES

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

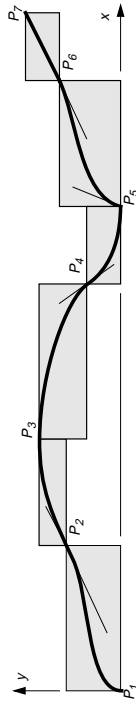
Start $A_0(0, 0)$: Tangent, Curvature or Power
End $B_0(1, 1)$: Tangent, Curvature or Power

Function Type Choice
Polynomials, Algebratics, 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.



GEOMETRY GENERATOR: PREPROCESSOR SOFTWARE FOR APPLIED AERODYNAMICS

INPUT WORK TOPICS OUTPUT

**BASIC PHENOMENA
MATHEMATICAL
MODELLING**

NUMERICAL
METHODS

COMPUTER SCIENCE TOOLS

**GEOMETRIES WITH
FLOW PHENOMENA
CONTROL PARAMETERS**

GRIDS FOR HIGH
RESOLUTION CFD ANALYSIS

ZONAL METHODS FOR
FAST FLOW SOLVERS

FLOW ELEMENTS
CONSTRUCTION FOR
AERODYNAMIC DESIGN
CONCEPTS

INTELLIGENT SYSTEMS

**INVERSE DESIGN AND
OPTIMIZATION STRATEGIES**

TEST CASE DEFINITION FOR
CFD AND EXPERIMENT

APPLIED CASE STUDIES AND
TOOLS FOR THE INDUSTRY

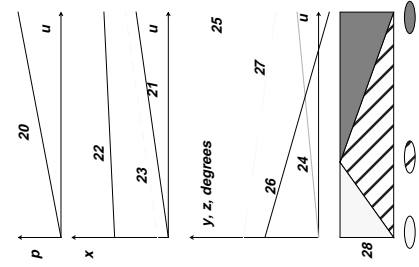
**AERODYNAMICS ON
WORKSTATIONS AND PC'S**



WING PARAMETERS

Characteristic Shape Parameters.
Example: Wing Geometry

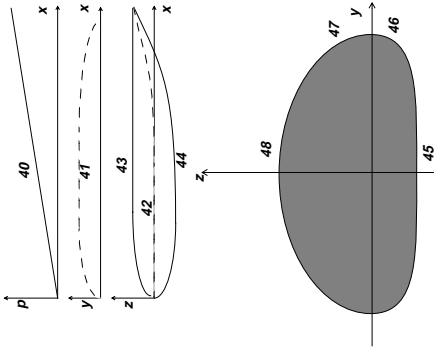
key #	Function
20	wing span station $u(p)$, $p = p(n)$
21	leading edge coo. $x_L(u)$
22	trailing edge $x_T(u)$
23	twist axis $x_D(u)$
24	twist axis $z_D(u)$
25	twist axis $y_D(u)$
26	twist in degrees $\alpha(u)$
27	airfoil thickness fac. $\tau(u)$
28	airfoil distribution $c(u)$



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 $e_4(x)$

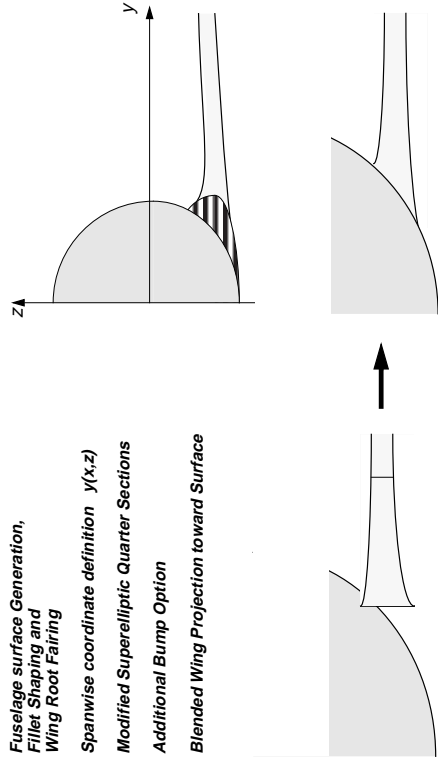


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COMPONENT JUNCTION

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

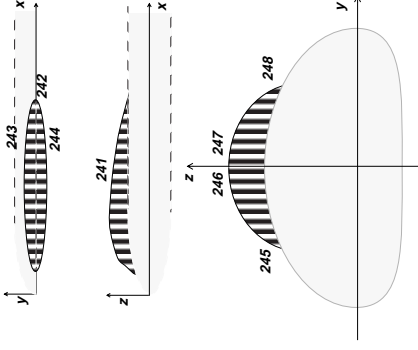


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BODY PARAMETERS (2)

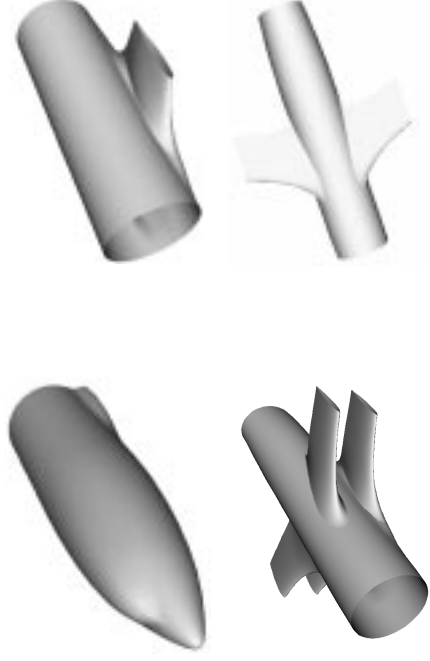
Characteristic Shape Parameters.
Example: Body vertical bumps (240, 340,...)

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 body. $y_{UB}(x)$
244	lower bump body. $y_{LB}(x)$
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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ILLUSTRATIONS



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