

P8 – 01 10 – 00048S
Wing Downwash



Table of contents

1 Summary..... 3
2 Aerodynamical calculations..... 3

1 SUMMARY

This report contains determination of PIK 28 downwash angle behind wing.

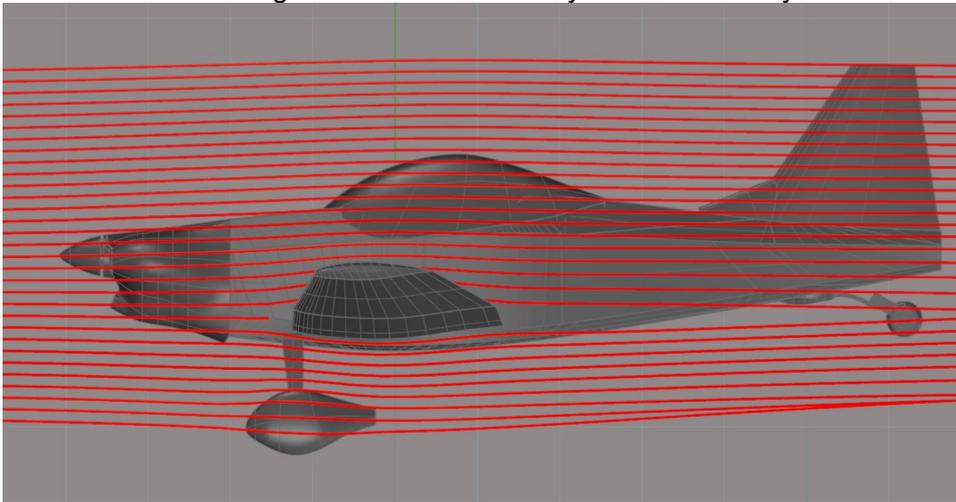
Change of downwash angle is calculated using CFD.

Wing geometry is taken from specification P8-0600-00023 and from 3D layout , Rhinoceros file version 18.

2 AERODYNAMICAL CALCULATIONS

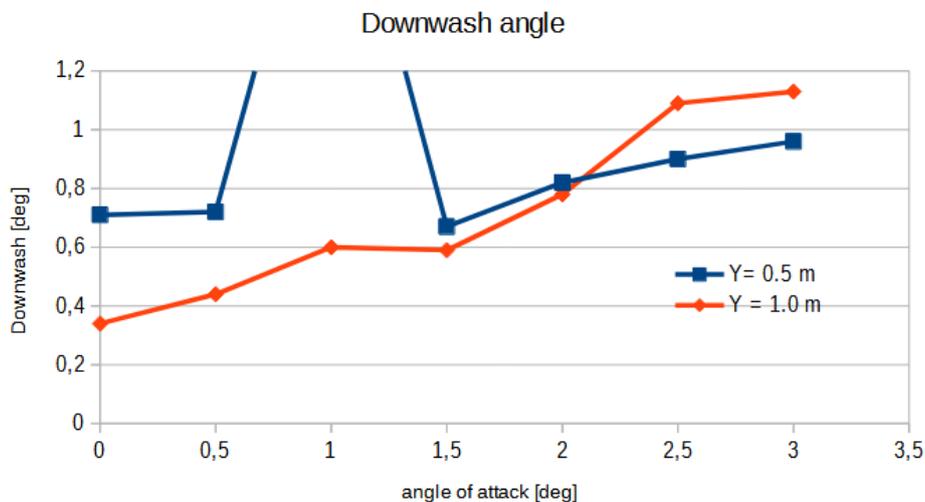
Model was calculate with angle of attack range 0 to 3 degrees in steps of 0,5 degrees.

Downwash angle is measured directly from CFD analysis streamlines.



Values were measured at the horizontal tail location at Y coordinates of Y=0,5 m and Y= 1,0 m.

As Horizontal tail span is 2,5 meters that pair represents nicely the working area of tail.



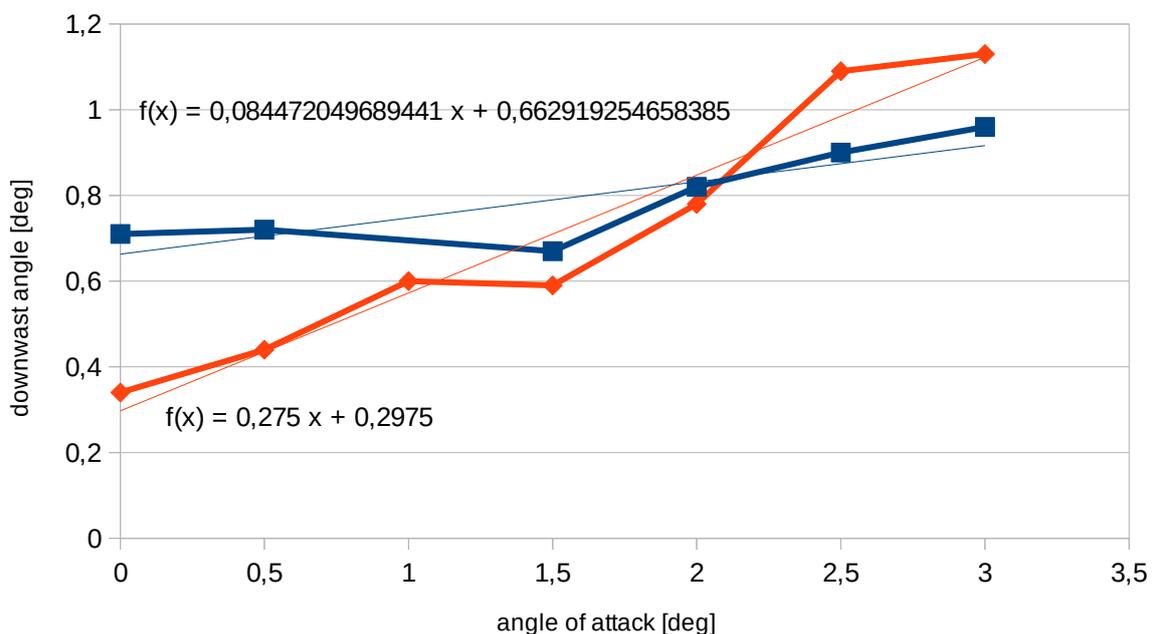
That value at $Y=0,5\text{m}$ was studied more closely. And it was not a numerical error.

A vortice starting from engine cowling did interfere with the vortice starting from rear fuselage lower corner in a way that just in the point where values were taken, flow was different. That single value can be disregarded.

The jagged shape of results is due to calculation being numerical iteration, and number of iterations being not exactly the same and the calculation cell grid was also slightly different for each case.

Value representing the change of downwash in function of angle of attack is needed for stability calculations.

This change is taken from linear trend of the values.



At $Y= 0,5 \text{ m}$ change is $0,08447 \text{ deg/deg}$

at $Y= 1,0 \text{ m}$ change is $0,275 \text{ deg/deg}$

And for stability estimation the average of these can be used. Being $0,1797 \text{ deg/deg}$

Downwash factor used in these calculation is

$$1 - de/da$$

$$1 - 0,1797 = \\ 0,8203$$

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