Appendix A. The system simulation data

These have been used as data of the AVVMS in the simulations of the dynamic control laws:

L = 1.2 m vehicle length
m = 299.4 kg vehicle weight
W = 2937 N
B = 2937 N
I_x = 12.5 Nms^2
I_y = 42.25 Nms^2
I_z = 42.25 Nms^2
$I_{xy} = I_{xz} = I_{yz}$ =0 Nms^2

Where

$$I_{ob} = \begin{bmatrix} I_x & I_{xy} & I_{xz} \\ I_{xy} & I_y & I_{yz} \\ I_{xz} & I_{yz} & I_z \end{bmatrix}$$

The hydrodynamic derivatives of the vehicle are given by:

X. u = -294	X_u = -700	$X_{u\|u\|}$ = -250
Y. v = -490.5	Y_v = -500	$Y_{v\|v\|}$ = -400
Z. w = -392.4	Z_w = -500	$Z_{w\|w\|}$ = -400
K. p = -98.1	K_p = -250	$K_{p\|p\|}$ = -350
M. q = -117.7	M_q = -200	$M_{p\|p\|}$ = -300
N. r = -9.8	N_r = -200	$N_{r\|r\|}$ = -300

All the links are modeled as cylinders. Their volumes are computed as $\delta_i = \pi * L_i r_i^2$, where L_i and r_i are the link lengths and radius, respectively. For each of the cylinder the mass is computed as:

$$M_i = \begin{bmatrix} m_i + 0.1\delta_i & 0 & 0 & 0 & 0 & 0 \\ 0 & m_i + \rho\delta_i & 0 & 0 & 0 & 0 \\ 0 & 0 & m_i + \rho\delta_i & 0 & 0 & 0 \\ 0 & 0 & 0 & I_{x,i} + \pi\rho L_i^3 r_i^2 /12 & 0 & 0 \\ 0 & 0 & 0 & 0 & I_{y,i} + \pi\rho L_i^3 r_i^2 /12 & 0 \\ 0 & 0 & 0 & 0 & 0 & I_{z,i} \end{bmatrix}$$