

UH-60 - Flight Simulation Data

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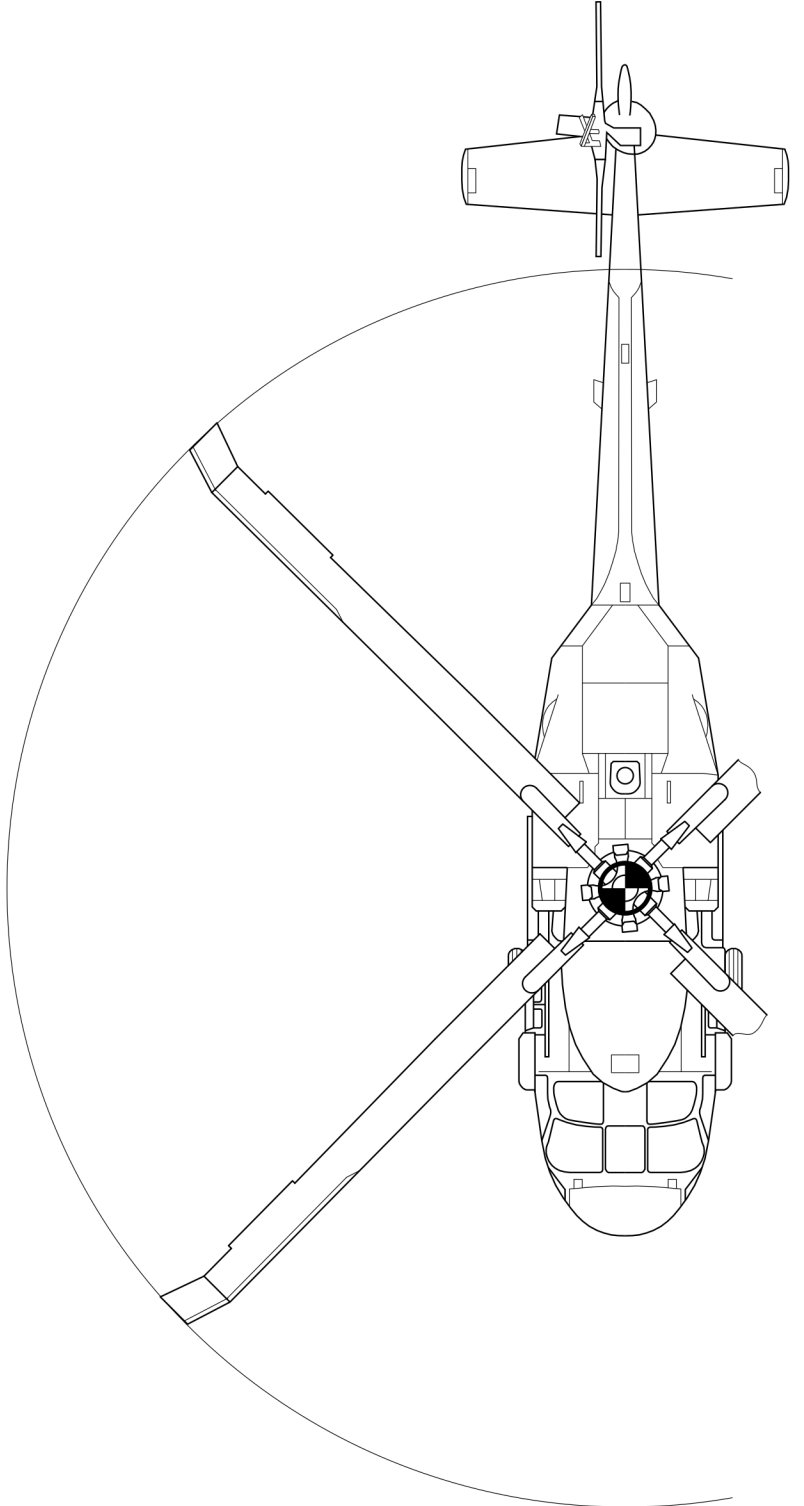
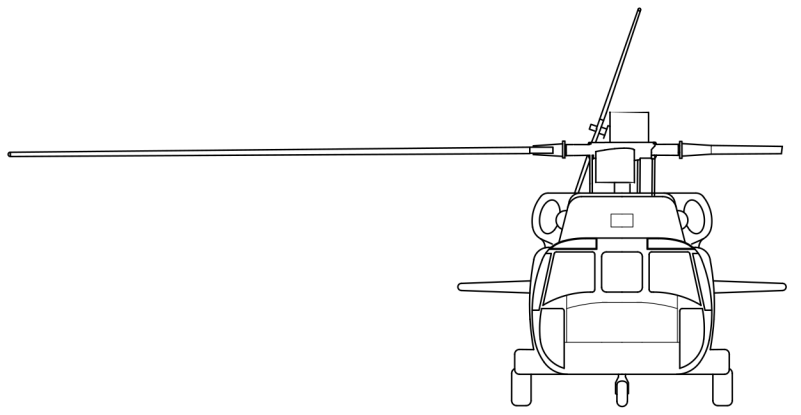
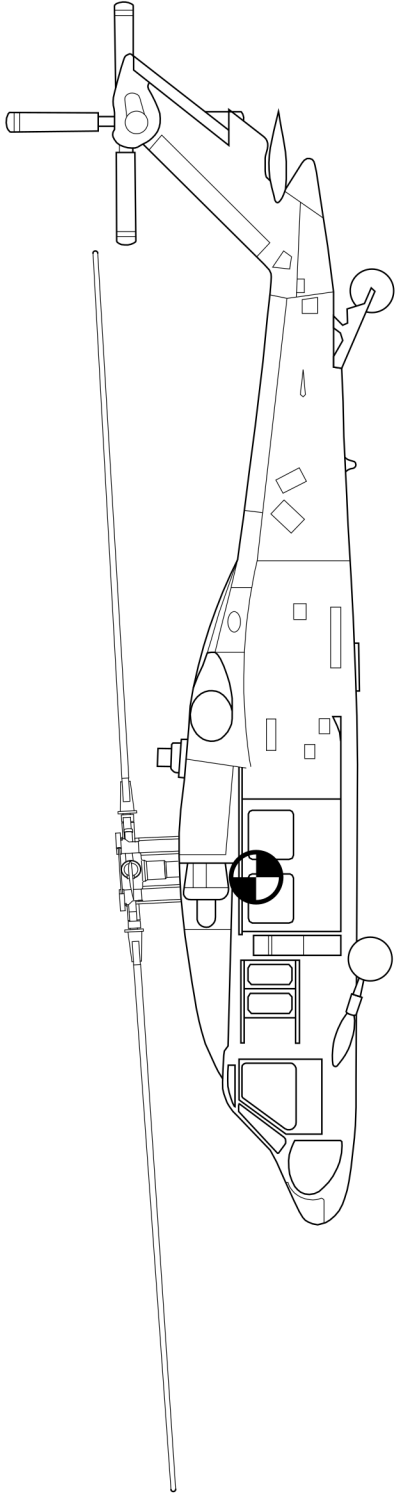
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1 Basic Data

| Parameter | Value | Reference |
|--|---------------------------|-----------|
| Main rotor diameter | 16.36 m | [1, 2] |
| Main rotor blade chord | 0.53 m | [1, 3] |
| Main rotor blade airfoil | SC1095/SC1094 R8 | [3, 4] |
| Main rotor solidity | 0.0826 | [3] |
| Main rotor shaft inclination angle | 3.0° | [3] |
| Main rotor nominal rotation speed | 258 rpm | [3] |
| Main rotor hinge offset | 0.38 m | [3] |
| Main rotor blade tip loss factor | 0.97 | [3] |
| Main rotor blade section lift curve slope | 5.73 rad ⁻¹ | [5] |
| Main rotor maximum thrust coefficient | 0.1846 | [5] |
| Main rotor single blade weight | 116.5 kg | [3] |
| Main rotor single blade moment of inertia about flapping hinge | 2 058.8 kg·m ² | [3] |
| Main rotor hub stationline | 8.67 m | [6] |
| Main rotor hub waterline | 8.00 m | [6] |
| Tail rotor diameter | 3.35 m | [1, 2] |
| Tail rotor blade chord | 0.25 m | [3] |
| Tail rotor blade airfoil | SC1095 | [3] |
| Tail rotor solidity | 0.1875 | [3] |
| Tail rotor cant angle | 20.0° | [2] |
| Tail rotor nominal rotation speed | 1 190 rpm | [3] |
| Tail rotor blade tip loss factor | 0.92 | [3] |
| Tail rotor blade section lift curve slope | 5.73 rad ⁻¹ | [5] |
| Tail rotor stationline | 18.59 m | [6] |
| Tail rotor waterline | 8.25 m | [6] |
| Fuselage length | 15.43 m | [2] |
| Fuselage width | 2.36 m | [2] |
| Fuselage aerodynamic reference point stationline | 8.78 m | [5] |
| Fuselage aerodynamic reference point waterline | 5.94 m | [5] |
| Cockpit floor waterline | 5.46 m | [6] |
| Cabin floor waterline | 5.25 m | [6] |
| Horizontal tail area | 4.18 m ² | [1, 3] |
| Horizontal tail airfoil | NACA 0014 | [3] |
| Horizontal tail stationline | 17.79 m | [5] |

| Parameter | Value | Reference |
|---|--|-----------|
| Horizontal tail waterline | 6.20 m | [5] |
| Horizontal tail deflection limit | up -30° , down $+35^\circ$ | [2] |
| Vertical tail area | 3.00 m ² | [1, 3] |
| Vertical tail airfoil | NACA 0021 | [3] |
| Vertical tail stationline | 17.65 m | [5] |
| Vertical tail waterline | 6.93 m | [5] |
| Lateral cyclic output at rotor | $+/-8.0^\circ$ | [3] |
| Longitudinal cyclic output at rotor | fwd. -12.3° , aft $+16.5^\circ$ | [3] |
| Collective output at rotor | low 9.9° , high 25.9° | [3] |
| Pedals output at tail rotor | right 0.1° , left 29.9° | [3] |
| Empty weight (UH-60A) | 5 118 kg | [1] |
| Empty weight (UH-60L) | 5 224 kg | [1] |
| Internal fuel tanks capacity | 1 361 l | [1, 2] |
| Internal fuel tanks stationline | 10.69 m | [2] |
| Center of mass stationline (for 7 258 kg) | 9.09 m | [3] |
| Center of mass waterline (for 7 258 kg) | 6.38 m | [3] |
| Moment of inertia I_x (for 7 258 kg) | 7 406 kg·m ² | [3] |
| Moment of inertia I_y (for 7 258 kg) | 53 513 kg·m ² | [3] |
| Moment of inertia I_z (for 7 258 kg) | 50 012 kg·m ² | [3] |
| Cross product of inertia I_{xz} (for 7 258 kg) | 2 134 kg·m ² | [3] |
| Engine manufacturer | General Electric | [1] |
| Engine model (UH-60A) | T700-GE-700 | [1, 2] |
| Engine model (UH-60L) | T700-GE-701C | [1, 2] |
| Engine model (UH-60M) | T700-GE-701D | [1] |
| Engine maximum power output (T700-GE-700) | 1 163 kW | [1] |
| Engine maximum power output (T700-GE-701C) | 1 402 kW | [1] |
| Engine maximum power output (T700-GE-701D) | 1 652 kW | [1] |
| Engine weight (T700-GE-701C) | 207 kg | [7] |
| Engine specific fuel consumption at maximum continuous power (T700-GE-701C) | 279.2 g/(kW·h) | [7] |

Table 1: Basic data

2 Performance Data

| Parameter | Value | Reference |
|---|---------------|-----------|
| Maximum take-off weight (UH-60A/L) | 11 113 kg | [1] |
| Mission take-off weight (UH-60A) | 7 708 kg | [1] |
| Mission take-off weight (UH-60L) | 7 907 kg | [1] |
| Maximum level speed (at SL, mission T-O weight, UH-60A) | 160 kts | [1] |
| Maximum level speed (at max T-O weight, UH-60A) | 158 kts | [1] |
| Never exceed speed (UH-60A/L) | 195 kts | [1] |
| Maximum cruise speed (at 4 000 ft, 35°C, UH-60A) | 139 kts | [1] |
| Maximum cruise speed (at 4 000 ft, 35°C, UH-60L) | 152 kts | [1] |
| Maximum rate of climb (at 4 000 ft, 35°C, UH-60A) | 390 ft/min | [1] |
| Maximum rate of climb (at 4 000 ft, 35°C, UH-60L) | 1 550 ft/min | [1] |
| Service ceiling (UH-60A) | 18 700 ft | [1] |
| Service ceiling (UH-60L) | 19 150 ft | [1] |
| Hovering ceiling (35°C, UH-60A) | 5 400 ft | [1] |
| Hovering ceiling (35°C, UH-60L) | 7 650 ft | [1] |
| Range (with maximum internal fuel, maximum T-O weight, 30 minutes reserves, UH-60A) | 319 nmi | [1] |
| Range (with maximum internal fuel, maximum T-O weight, 30 minutes reserves, UH-60L) | 315 nmi | [1] |
| Endurance (UH-60A) | 2 h 18 min ft | [1] |
| Endurance (UH-60L) | 2 h 06 min ft | [1] |

Table 2: Performance data

3 Blades Data

3.1 Blades Airfoils

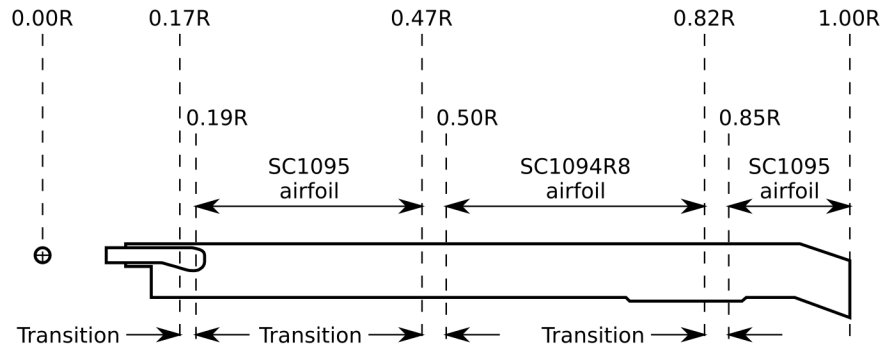


Figure 1: Main rotor blade airfoil section locations [8]

3.1.1 SC1094 R8

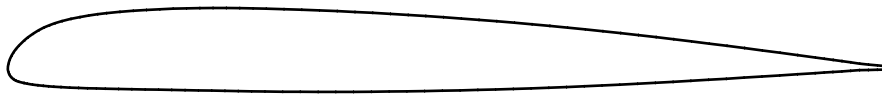


Figure 2: SC1094 R8

Ordinates

| Upper surface | | Lower surface | |
|---------------|---------|---------------|----------|
| x/c | y/c | x/c | y/c |
| 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| 0.00013 | 0.00185 | 0.00007 | -0.00180 |
| 0.00090 | 0.00559 | 0.00072 | -0.00501 |
| 0.00218 | 0.00945 | 0.00188 | -0.00773 |
| 0.00427 | 0.01398 | 0.00384 | -0.01053 |
| 0.00686 | 0.01825 | 0.00632 | -0.01277 |
| 0.00944 | 0.02174 | 0.00881 | -0.01419 |
| 0.01252 | 0.02532 | 0.01181 | -0.01540 |

| Upper surface | | Lower surface | |
|---------------|---------|---------------|----------|
| x/c | y/c | x/c | y/c |
| 0.01867 | 0.03126 | 0.01783 | -0.01702 |
| 0.02245 | 0.03441 | 0.02154 | -0.01773 |
| 0.02857 | 0.03890 | 0.02757 | -0.01872 |
| 0.03468 | 0.04264 | 0.03360 | -0.01953 |
| 0.04077 | 0.04576 | 0.03963 | -0.02017 |
| 0.04686 | 0.04837 | 0.04566 | -0.02070 |
| 0.05294 | 0.05058 | 0.05169 | -0.02115 |
| 0.06104 | 0.05306 | 0.05974 | -0.02166 |
| 0.07115 | 0.05558 | 0.06980 | -0.02218 |
| 0.08125 | 0.05764 | 0.07986 | -0.02260 |
| 0.09135 | 0.05937 | 0.08992 | -0.02294 |
| 0.10145 | 0.06083 | 0.09998 | -0.02323 |
| 0.11154 | 0.06206 | 0.11005 | -0.02348 |
| 0.12666 | 0.06359 | 0.12514 | -0.02379 |
| 0.14179 | 0.06479 | 0.14024 | -0.02406 |
| 0.15691 | 0.06576 | 0.15534 | -0.02432 |
| 0.17202 | 0.06656 | 0.17044 | -0.02459 |
| 0.18714 | 0.06718 | 0.18554 | -0.02485 |
| 0.20225 | 0.06762 | 0.20063 | -0.02512 |
| 0.21735 | 0.06790 | 0.21573 | -0.02538 |
| 0.23246 | 0.06801 | 0.23083 | -0.02564 |
| 0.24756 | 0.06798 | 0.24593 | -0.02591 |
| 0.26266 | 0.06783 | 0.26103 | -0.02617 |
| 0.27776 | 0.06758 | 0.27612 | -0.02643 |
| 0.29286 | 0.06725 | 0.29122 | -0.02665 |
| 0.31298 | 0.06671 | 0.31136 | -0.02687 |
| 0.33311 | 0.06606 | 0.33149 | -0.02701 |
| 0.35323 | 0.06531 | 0.35163 | -0.02708 |
| 0.37336 | 0.06446 | 0.37176 | -0.02709 |
| 0.39348 | 0.06352 | 0.39190 | -0.02702 |
| 0.41360 | 0.06250 | 0.41204 | -0.02690 |
| 0.43371 | 0.06139 | 0.43218 | -0.02671 |
| 0.45383 | 0.06019 | 0.45232 | -0.02647 |
| 0.47394 | 0.05892 | 0.47246 | -0.02616 |
| 0.49406 | 0.05756 | 0.49261 | -0.02580 |
| 0.51417 | 0.05612 | 0.51275 | -0.02537 |
| 0.53428 | 0.05460 | 0.53290 | -0.02489 |
| 0.55439 | 0.05300 | 0.55304 | -0.02435 |

| Upper surface | | Lower surface | |
|---------------|---------|---------------|----------|
| x/c | y/c | x/c | y/c |
| 0.57450 | 0.05132 | 0.57319 | -0.02375 |
| 0.59460 | 0.04955 | 0.59334 | -0.02309 |
| 0.61471 | 0.04771 | 0.61349 | -0.02237 |
| 0.63481 | 0.04579 | 0.63364 | -0.02159 |
| 0.65491 | 0.04379 | 0.65379 | -0.02075 |
| 0.67501 | 0.04171 | 0.67394 | -0.01985 |
| 0.69511 | 0.03955 | 0.69409 | -0.01889 |
| 0.71521 | 0.03732 | 0.71425 | -0.01788 |
| 0.73531 | 0.03501 | 0.73440 | -0.01682 |
| 0.75540 | 0.03263 | 0.75456 | -0.01572 |
| 0.77550 | 0.03020 | 0.77472 | -0.01458 |
| 0.79559 | 0.02771 | 0.79487 | -0.01340 |
| 0.81568 | 0.02518 | 0.81503 | -0.01220 |
| 0.83577 | 0.02260 | 0.83519 | -0.01097 |
| 0.85587 | 0.01998 | 0.85535 | -0.00972 |
| 0.87596 | 0.01733 | 0.87551 | -0.00845 |
| 0.89605 | 0.01466 | 0.89567 | -0.00718 |
| 0.91614 | 0.01195 | 0.91583 | -0.00589 |
| 0.92618 | 0.01059 | 0.92591 | -0.00524 |
| 0.93623 | 0.00921 | 0.93599 | -0.00458 |
| 0.94627 | 0.00782 | 0.94607 | -0.00390 |
| 0.95631 | 0.00641 | 0.95615 | -0.00322 |
| 0.96636 | 0.00498 | 0.96623 | -0.00251 |
| 0.97641 | 0.00398 | 0.97630 | -0.00227 |
| 0.98646 | 0.00301 | 0.98637 | -0.00203 |
| 0.99651 | 0.00205 | 0.99644 | -0.00180 |
| 1.00000 | 0.00171 | 1.00000 | -0.00171 |

Table 3: SC1094 R8 [4]

Aerodynamic Characteristics

| α | C_L | C_D | C_m |
|----------|---------|---------|---------|
| [deg] | [-] | [-] | [-] |
| -8.000 | -0.7472 | 0.01096 | -0.0281 |
| -7.000 | -0.6360 | 0.00946 | -0.0255 |
| -6.000 | -0.5209 | 0.00834 | -0.0238 |

| α [deg] | C_L [-] | C_D [-] | C_m [-] |
|-------------------|--------------|--------------|--------------|
| -5.000 | -0.4027 | 0.00750 | -0.0229 |
| -4.000 | -0.2838 | 0.00692 | -0.0224 |
| -3.000 | -0.1644 | 0.00688 | -0.0223 |
| -2.000 | -0.0450 | 0.00708 | -0.0225 |
| -1.000 | 0.0746 | 0.00715 | -0.0227 |
| 0.000 | 0.1941 | 0.00728 | -0.0230 |
| 1.000 | 0.3133 | 0.00726 | -0.0234 |
| 5.000 | 0.7768 | 0.00678 | -0.0219 |
| 6.000 | 0.8969 | 0.00734 | -0.0224 |
| 7.000 | 1.0156 | 0.00791 | -0.0224 |
| 8.000 | 1.1331 | 0.00857 | -0.0223 |
| 9.000 | 1.2494 | 0.00930 | -0.0218 |
| 10.000 | 1.3643 | 0.01015 | -0.0210 |
| 11.000 | 1.4782 | 0.01100 | -0.0200 |
| 12.000 | 1.5889 | 0.01213 | -0.0184 |
| 13.000 | 1.6989 | 0.01316 | -0.0166 |
| 14.000 | 1.8039 | 0.01454 | -0.0141 |
| 15.000 | 1.9019 | 0.01627 | -0.0106 |
| 16.000 | 1.9591 | 0.02046 | -0.0029 |
| 17.000 | 1.9817 | 0.02535 | 0.0076 |
| 18.000 | 1.9875 | 0.03366 | 0.0124 |
| 19.000 | 1.9489 | 0.04994 | 0.0086 |
| 20.000 | 1.7899 | 0.08656 | -0.0105 |

Table 4: SC1094 R8 aerodynamic coefficients (XFOIL)

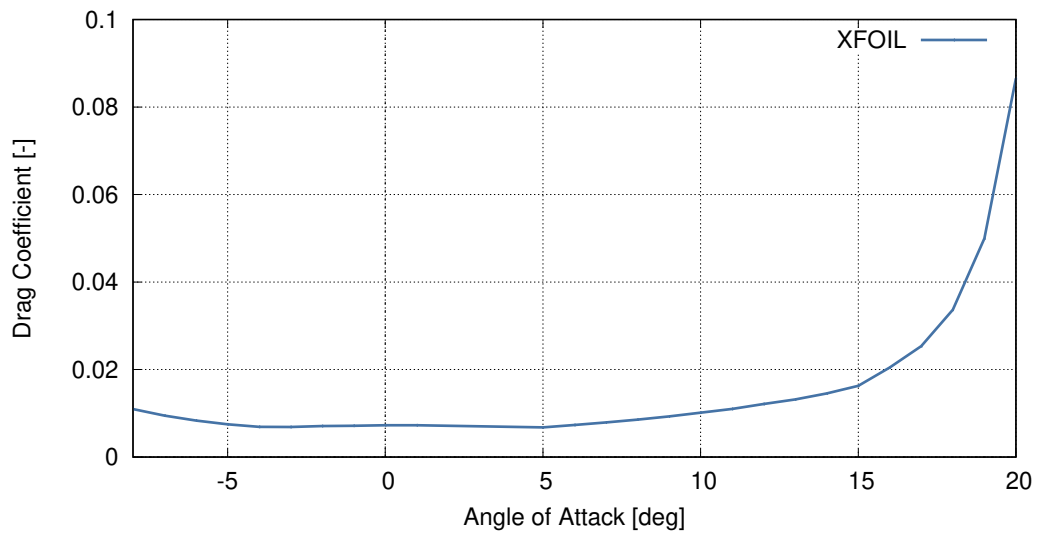


Figure 3: SC1094 R8 drag coefficient

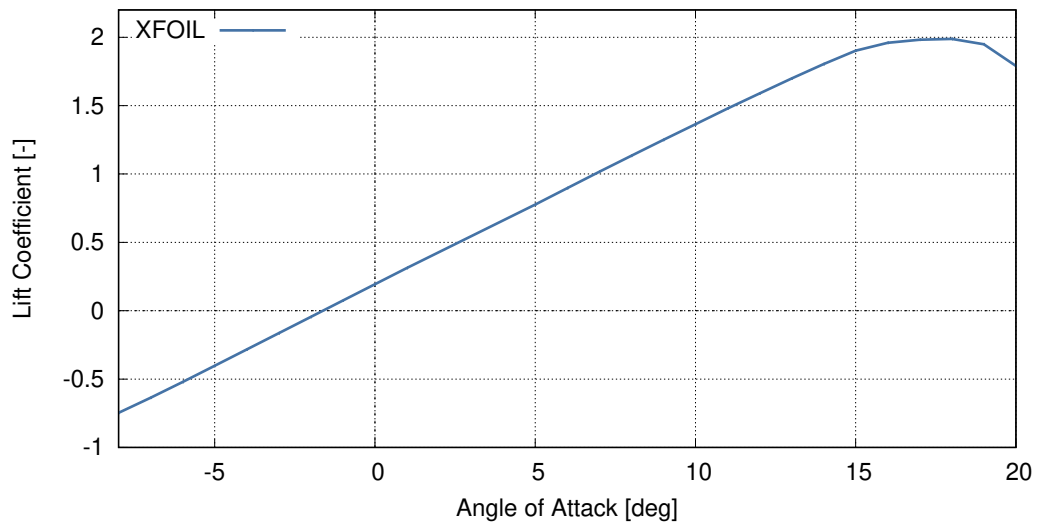


Figure 4: SC1094 R8 lift coefficient

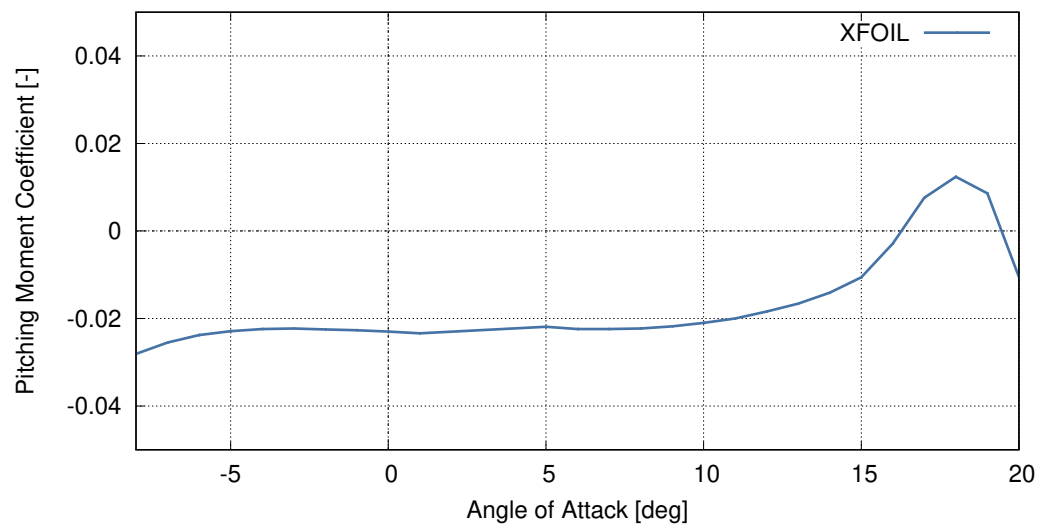


Figure 5: SC1094 R8 pitching moment coefficient

3.1.2 SC1095



Figure 6: SC1095

Ordinates

| Upper surface | | Lower surface | |
|---------------|---------|---------------|----------|
| x/c | y/c | x/c | y/c |
| 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| 0.00010 | 0.00147 | 0.00010 | -0.00112 |
| 0.00081 | 0.00396 | 0.00081 | -0.00322 |
| 0.00203 | 0.00626 | 0.00203 | -0.00510 |
| 0.00407 | 0.00913 | 0.00407 | -0.00757 |
| 0.00661 | 0.01215 | 0.00661 | -0.01020 |
| 0.00915 | 0.01473 | 0.00915 | -0.01236 |
| 0.01220 | 0.01748 | 0.01220 | -0.01453 |
| 0.01830 | 0.02220 | 0.01830 | -0.01798 |
| 0.02440 | 0.02608 | 0.02440 | -0.02066 |
| 0.03050 | 0.02934 | 0.03050 | -0.02293 |
| 0.03660 | 0.03208 | 0.03660 | -0.02494 |
| 0.04271 | 0.03443 | 0.04271 | -0.02669 |
| 0.05084 | 0.03707 | 0.05084 | -0.02862 |
| 0.06101 | 0.03979 | 0.06101 | -0.03048 |
| 0.07117 | 0.04205 | 0.07117 | -0.03191 |
| 0.08134 | 0.04398 | 0.08134 | -0.03304 |
| 0.09151 | 0.04562 | 0.09151 | -0.03397 |
| 0.10168 | 0.04705 | 0.10168 | -0.03476 |
| 0.11693 | 0.04885 | 0.11693 | -0.03580 |
| 0.13218 | 0.05033 | 0.13218 | -0.03666 |
| 0.14743 | 0.05158 | 0.14743 | -0.03737 |
| 0.16268 | 0.05265 | 0.16268 | -0.03795 |
| 0.17794 | 0.05354 | 0.17794 | -0.03841 |
| 0.19319 | 0.05426 | 0.19319 | -0.03876 |
| 0.20844 | 0.05480 | 0.20844 | -0.03903 |

| Upper surface | | Lower surface | |
|---------------|---------|---------------|----------|
| x/c | y/c | x/c | y/c |
| 0.22369 | 0.05518 | 0.22369 | -0.03923 |
| 0.23894 | 0.05541 | 0.23894 | -0.03935 |
| 0.25419 | 0.05553 | 0.25419 | -0.03941 |
| 0.26945 | 0.05554 | 0.26945 | -0.03941 |
| 0.28470 | 0.05547 | 0.28470 | -0.03937 |
| 0.30503 | 0.05528 | 0.30503 | -0.03924 |
| 0.32537 | 0.05498 | 0.32537 | -0.03903 |
| 0.34570 | 0.05458 | 0.34570 | -0.03874 |
| 0.36604 | 0.05407 | 0.36604 | -0.03839 |
| 0.38638 | 0.05348 | 0.38638 | -0.03797 |
| 0.40671 | 0.05280 | 0.40671 | -0.03749 |
| 0.42705 | 0.05203 | 0.42705 | -0.03695 |
| 0.44738 | 0.05118 | 0.44738 | -0.03635 |
| 0.46772 | 0.05024 | 0.46772 | -0.03569 |
| 0.48805 | 0.04922 | 0.48805 | -0.03497 |
| 0.50839 | 0.04812 | 0.50839 | -0.03419 |
| 0.52872 | 0.04694 | 0.52872 | -0.03335 |
| 0.54906 | 0.04568 | 0.54906 | -0.03245 |
| 0.56940 | 0.04434 | 0.56940 | -0.03149 |
| 0.58973 | 0.04291 | 0.58973 | -0.03047 |
| 0.61007 | 0.04140 | 0.61007 | -0.02938 |
| 0.63040 | 0.03982 | 0.63040 | -0.02824 |
| 0.65074 | 0.03815 | 0.65074 | -0.02703 |
| 0.67107 | 0.03640 | 0.67107 | -0.02577 |
| 0.69141 | 0.03458 | 0.69141 | -0.02445 |
| 0.71174 | 0.03267 | 0.71174 | -0.02308 |
| 0.73208 | 0.03070 | 0.73208 | -0.02166 |
| 0.75242 | 0.02865 | 0.75242 | -0.02019 |
| 0.77275 | 0.02655 | 0.77275 | -0.01868 |
| 0.79309 | 0.02439 | 0.79309 | -0.01714 |
| 0.81342 | 0.02218 | 0.81342 | -0.01557 |
| 0.83376 | 0.01993 | 0.83376 | -0.01397 |
| 0.85409 | 0.01764 | 0.85409 | -0.01236 |
| 0.87443 | 0.01532 | 0.87443 | -0.01072 |
| 0.89476 | 0.01297 | 0.89476 | -0.00908 |
| 0.91510 | 0.01060 | 0.91510 | -0.00742 |
| 0.92527 | 0.00939 | 0.92527 | -0.00659 |
| 0.93544 | 0.00818 | 0.93544 | -0.00575 |

| Upper surface | | Lower surface | |
|---------------|---------|---------------|----------|
| x/c | y/c | x/c | y/c |
| 0.94560 | 0.00695 | 0.94560 | -0.00489 |
| 0.95577 | 0.00570 | 0.95577 | -0.00402 |
| 0.96594 | 0.00443 | 0.96594 | -0.00313 |
| 0.97611 | 0.00360 | 0.97611 | -0.00271 |
| 0.98627 | 0.00281 | 0.98627 | -0.00229 |
| 0.99644 | 0.00201 | 0.99644 | -0.00188 |
| 1.00000 | 0.00173 | 1.00000 | -0.00173 |

Table 5: SC1095 [4]

Aerodynamic Characteristics

| α [deg] | C_L [-] | C_D [-] | C_m [-] |
|-------------------|--------------|--------------|--------------|
| -2.32 | -0.234 | 0.0103 | -0.0116 |
| -1.57 | -0.129 | 0.0094 | -0.0127 |
| -0.91 | -0.028 | 0.0095 | -0.0112 |
| 0.00 | 0.062 | 0.0102 | -0.0098 |
| 0.64 | 0.157 | 0.0094 | -0.0122 |
| 1.41 | 0.276 | 0.0097 | -0.0120 |
| 2.14 | 0.358 | 0.0095 | -0.0113 |
| 2.93 | 0.465 | 0.0093 | -0.0117 |
| 3.59 | 0.573 | 0.0104 | -0.0125 |
| 4.32 | 0.673 | 0.0110 | -0.0117 |
| 5.09 | 0.774 | 0.0109 | -0.0107 |
| 5.90 | 0.860 | 0.0115 | -0.0112 |
| 6.57 | 0.961 | 0.0125 | -0.0089 |
| 7.35 | 1.062 | 0.0138 | -0.0079 |
| 8.18 | 1.157 | 0.0161 | -0.0063 |
| 9.04 | 1.211 | 0.0178 | -0.0078 |
| 9.79 | 1.271 | 0.0198 | -0.0033 |
| 10.35 | 1.244 | | |
| 10.99 | 1.178 | | |
| 12.28 | 1.018 | | |

Table 6: SC1095 aerodynamic coefficients [9]

| α [deg] | C_L [-] | C_D [-] | C_m [-] |
|-------------------|--------------|--------------|--------------|
| -8.000 | -0.8436 | 0.00949 | -0.0159 |
| -7.000 | -0.7335 | 0.00848 | -0.0138 |
| -6.000 | -0.6211 | 0.00729 | -0.0123 |
| -5.000 | -0.5064 | 0.00663 | -0.0115 |
| -4.000 | -0.3885 | 0.00604 | -0.0115 |
| -3.000 | -0.2692 | 0.00581 | -0.0119 |
| -2.000 | -0.1501 | 0.00595 | -0.0124 |
| -1.000 | -0.0311 | 0.00614 | -0.0132 |
| 0.000 | 0.0877 | 0.00617 | -0.0141 |
| 1.000 | 0.2066 | 0.00590 | -0.0151 |
| 4.000 | 0.5592 | 0.00608 | -0.0162 |
| 5.000 | 0.6725 | 0.00651 | -0.0152 |
| 6.000 | 0.7856 | 0.00698 | -0.0141 |
| 7.000 | 0.9064 | 0.00760 | -0.0148 |
| 8.000 | 1.0217 | 0.00879 | -0.0146 |
| 9.000 | 1.1314 | 0.01081 | -0.0134 |
| 10.000 | 1.2426 | 0.01226 | -0.0122 |
| 11.000 | 1.3490 | 0.01420 | -0.0102 |
| 12.000 | 1.4503 | 0.01646 | -0.0075 |
| 13.000 | 1.5418 | 0.01938 | -0.0038 |
| 14.000 | 1.6068 | 0.02400 | 0.0025 |
| 15.000 | 1.6128 | 0.03083 | 0.0127 |
| 16.000 | 1.5784 | 0.04612 | 0.0101 |
| 17.000 | 1.3386 | 0.10309 | -0.0243 |
| 18.000 | 1.1542 | 0.15419 | -0.0543 |
| 19.000 | 1.1143 | 0.18223 | -0.0721 |
| 20.000 | 1.1117 | 0.20296 | -0.0861 |

Table 7: SC1095 aerodynamic coefficients (XFOIL)

| α [deg] | C_L [-] | C_D [-] |
|-------------------|--------------|--------------|
| -180.0 | 0.00000 | 0.00000 |
| -178.0 | 0.25667 | 0.36700 |
| -176.0 | 0.51330 | 0.73300 |
| -174.0 | 0.77000 | 1.10000 |
| -172.0 | 0.75500 | 1.06500 |

| α [deg] | C_L [-] | C_D [-] |
|-------------------|--------------|--------------|
| -170.0 | 0.74000 | 1.03000 |
| -168.0 | 0.72500 | 0.99500 |
| -166.0 | 0.71000 | 0.96000 |
| -164.0 | 0.69500 | 0.92000 |
| -162.0 | 0.68000 | 0.88000 |
| -160.0 | 0.66500 | 0.84000 |
| -158.0 | 0.65000 | 0.80000 |
| -156.0 | 0.72500 | 0.76000 |
| -154.0 | 0.80000 | 0.72000 |
| -152.0 | 0.87500 | 0.68000 |
| -150.0 | 0.95000 | 0.64000 |
| -148.0 | 0.91750 | 0.68750 |
| -146.0 | 0.88500 | 0.73500 |
| -144.0 | 0.85250 | 0.78250 |
| -142.0 | 0.82000 | 0.83000 |
| -140.0 | 0.78750 | 0.87875 |
| -138.0 | 0.75500 | 0.92750 |
| -136.0 | 0.72250 | 0.97625 |
| -134.0 | 0.69000 | 1.02500 |
| -132.0 | 0.65750 | 1.07375 |
| -130.0 | 0.62500 | 1.12250 |
| -128.0 | 0.59250 | 1.17125 |
| -126.0 | 0.56000 | 1.22000 |
| -124.0 | 0.52750 | 1.26875 |
| -122.0 | 0.49500 | 1.31750 |
| -120.0 | 0.46250 | 1.36625 |
| -118.0 | 0.43000 | 1.41500 |
| -116.0 | 0.39750 | 1.46375 |
| -114.0 | 0.36500 | 1.51250 |
| -112.0 | 0.33250 | 1.56125 |
| -110.0 | 0.30000 | 1.61000 |
| -108.0 | 0.26750 | 1.66000 |
| -106.0 | 0.23500 | 1.71000 |
| -104.0 | 0.20250 | 1.76000 |
| -102.0 | 0.17000 | 1.81000 |
| -100.0 | 0.13750 | 1.85750 |
| -98.0 | 0.10500 | 1.90500 |
| -96.0 | 0.07250 | 1.95250 |

| α [deg] | C_L [-] | C_D [-] |
|-------------------|--------------|--------------|
| -94.0 | 0.04000 | 2.00000 |
| -92.0 | 0.00750 | 2.02625 |
| -90.0 | -0.02500 | 2.05250 |
| -88.0 | -0.05750 | 2.07875 |
| -86.0 | -0.09000 | 2.10500 |
| -84.0 | -0.12250 | 2.09875 |
| -82.0 | -0.15500 | 2.09250 |
| -80.0 | -0.18750 | 2.08625 |
| -78.0 | -0.22000 | 2.08000 |
| -76.0 | -0.25250 | 2.05500 |
| -74.0 | -0.28500 | 2.03000 |
| -72.0 | -0.31750 | 2.00500 |
| -70.0 | -0.35000 | 1.98000 |
| -68.0 | -0.38250 | 1.92875 |
| -66.0 | -0.41500 | 1.87750 |
| -64.0 | -0.44750 | 1.82625 |
| -62.0 | -0.48000 | 1.77500 |
| -60.0 | -0.51250 | 1.70125 |
| -58.0 | -0.54500 | 1.62750 |
| -56.0 | -0.57750 | 1.55375 |
| -54.0 | -0.61000 | 1.48000 |
| -52.0 | -0.64250 | 1.40750 |
| -50.0 | -0.67500 | 1.33500 |
| -48.0 | -0.70750 | 1.26250 |
| -46.0 | -0.74000 | 1.19000 |
| -44.0 | -0.77250 | 1.11750 |
| -42.0 | -0.80500 | 1.04500 |
| -40.0 | -0.83750 | 0.97250 |
| -38.0 | -0.87000 | 0.90000 |
| -36.0 | -0.90250 | 0.83250 |
| -34.0 | -0.93500 | 0.76500 |
| -32.0 | -0.96750 | 0.69750 |
| -30.0 | -1.00000 | 0.63000 |
| -28.0 | -0.99600 | 0.56200 |
| -26.0 | -0.99200 | 0.48800 |
| -24.0 | -0.99800 | 0.41700 |
| -22.0 | -0.98400 | 0.34000 |
| -20.0 | -0.98000 | 0.26700 |

| α [deg] | C_L [-] | C_D [-] |
|-------------------|--------------|--------------|
| -18.0 | -0.97600 | 0.19500 |
| -16.0 | -0.97200 | 0.12000 |
| -14.0 | -1.07000 | 0.04500 |
| -12.0 | -0.72400 | 0.01800 |
| -10.0 | -0.37000 | 0.01200 |
| -8.0 | -0.19000 | 0.00800 |
| -6.0 | -0.39000 | 0.00775 |
| -4.0 | -0.45000 | 0.00750 |
| -2.0 | -0.19000 | 0.00750 |
| 0.0 | 0.03000 | 0.00750 |
| 2.0 | 0.24300 | 0.00800 |
| 4.0 | 0.46000 | 0.00850 |
| 6.0 | 0.67000 | 0.00900 |
| 8.0 | 0.89000 | 0.01100 |
| 10.0 | 1.10000 | 0.01700 |
| 12.0 | 1.25000 | 0.02600 |
| 14.0 | 1.10000 | 0.14500 |
| 16.0 | 0.98000 | 0.23000 |
| 18.0 | 0.98280 | 0.29300 |
| 20.0 | 0.98560 | 0.34500 |
| 22.0 | 0.98840 | 0.40000 |
| 24.0 | 0.99120 | 0.45500 |
| 26.0 | 0.99400 | 0.50700 |
| 28.0 | 0.99700 | 0.56000 |
| 30.0 | 1.00000 | 0.63000 |
| 32.0 | 0.96750 | 0.69750 |
| 34.0 | 0.93500 | 0.76500 |
| 36.0 | 0.90250 | 0.83250 |
| 38.0 | 0.87000 | 0.90000 |
| 40.0 | 0.83750 | 0.97250 |
| 42.0 | 0.80500 | 1.04500 |
| 44.0 | 0.77250 | 1.11750 |
| 46.0 | 0.74000 | 1.19000 |
| 48.0 | 0.70750 | 1.26250 |
| 50.0 | 0.67500 | 1.33500 |
| 52.0 | 0.64250 | 1.40750 |
| 54.0 | 0.61000 | 1.48000 |
| 56.0 | 0.57750 | 1.55375 |

| α [deg] | C_L [-] | C_D [-] |
|-------------------|--------------|--------------|
| 58.0 | 0.54500 | 1.62750 |
| 60.0 | 0.51250 | 1.70125 |
| 62.0 | 0.48000 | 1.77500 |
| 64.0 | 0.44750 | 1.82625 |
| 66.0 | 0.41500 | 1.87750 |
| 68.0 | 0.38250 | 1.92875 |
| 70.0 | 0.35000 | 1.98000 |
| 72.0 | 0.31750 | 2.00500 |
| 74.0 | 0.28500 | 2.03000 |
| 76.0 | 0.25250 | 2.05500 |
| 78.0 | 0.22000 | 2.08000 |
| 80.0 | 0.18750 | 2.08625 |
| 82.0 | 0.15500 | 2.09250 |
| 84.0 | 0.12250 | 2.09875 |
| 86.0 | 0.09000 | 2.10500 |
| 88.0 | 0.05750 | 2.07875 |
| 90.0 | 0.02500 | 2.05250 |
| 92.0 | -0.00750 | 2.02625 |
| 94.0 | -0.04000 | 2.00000 |
| 96.0 | -0.07250 | 1.95250 |
| 98.0 | -0.10500 | 1.90500 |
| 100.0 | -0.13750 | 1.85750 |
| 102.0 | -0.17000 | 1.81000 |
| 104.0 | -0.20250 | 1.76000 |
| 106.0 | -0.23600 | 1.71000 |
| 108.0 | -0.26750 | 1.66000 |
| 110.0 | -0.30000 | 1.61000 |
| 112.0 | -0.33250 | 1.56125 |
| 114.0 | -0.36500 | 1.51250 |
| 116.0 | -0.39750 | 1.46375 |
| 118.0 | -0.43000 | 1.41500 |
| 120.0 | -0.46250 | 1.36625 |
| 122.0 | -0.49500 | 1.31750 |
| 124.0 | -0.52750 | 1.26875 |
| 126.0 | -0.56000 | 1.22000 |
| 128.0 | -0.59250 | 1.17125 |
| 130.0 | -0.62500 | 1.12250 |
| 132.0 | -0.65750 | 1.07375 |

| α [deg] | C_L [-] | C_D [-] |
|-------------------|--------------|--------------|
| 134.0 | -0.69000 | 1.02500 |
| 136.0 | -0.72250 | 0.97625 |
| 138.0 | -0.75500 | 0.92720 |
| 140.0 | -0.78750 | 0.87875 |
| 142.0 | -0.82000 | 0.83000 |
| 144.0 | -0.85250 | 0.78250 |
| 146.0 | -0.88500 | 0.73500 |
| 148.0 | -0.91750 | 0.68750 |
| 150.0 | -0.96000 | 0.64000 |
| 152.0 | -0.87500 | 0.68000 |
| 154.0 | -0.80000 | 0.72000 |
| 156.0 | -0.72500 | 0.76000 |
| 158.0 | -0.65000 | 0.80000 |
| 160.0 | -0.66500 | 0.84000 |
| 162.0 | -0.68000 | 0.88000 |
| 164.0 | -0.69500 | 0.92000 |
| 166.0 | -0.71000 | 0.96000 |
| 168.0 | -0.72500 | 0.99500 |
| 170.0 | -0.74000 | 1.03000 |
| 172.0 | -0.75500 | 1.06500 |
| 174.0 | 0.77000 | 1.10000 |
| 176.0 | 0.51330 | 0.73300 |
| 178.0 | -0.25667 | 0.36700 |
| 180.0 | 0.00000 | 0.00000 |

Table 8: SC1095 aerodynamic coefficients [3]

| α [deg] | C_L | | | | | | | | | | |
|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | Ma=0.0 | Ma=0.1 | Ma=0.2 | Ma=0.3 | Ma=0.4 | Ma=0.5 | Ma=0.6 | Ma=0.7 | Ma=0.8 | Ma=0.9 | Ma=10.0 |
| -32.0 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 | -0.9675 |
| -30.0 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 | -1.0000 |
| -28.0 | -0.9960 | -0.9960 | -0.9960 | -0.9960 | -0.9550 | -0.9400 | -0.9460 | -0.9440 | -0.9300 | -0.9220 | -0.9180 |
| -26.0 | -0.9920 | -0.9920 | -0.9920 | -0.9920 | -0.9600 | -0.9300 | -0.9420 | -0.9380 | -0.9100 | -0.8940 | -0.8860 |
| -24.0 | -0.9880 | -0.9880 | -0.9880 | -0.9880 | -0.9620 | -0.9200 | -0.9380 | -0.9320 | -0.8900 | -0.8660 | -0.8540 |
| -22.0 | -0.9840 | -0.9840 | -0.9840 | -0.9840 | -0.9640 | -0.9250 | -0.9340 | -0.9260 | -0.8700 | -0.8380 | -0.8220 |
| -20.0 | -0.9800 | -0.9800 | -0.9800 | -0.9800 | -0.9660 | -0.9300 | -0.9300 | -0.9200 | -0.8500 | -0.8100 | -0.7900 |
| -18.0 | -0.9760 | -0.9760 | -0.9760 | -0.9760 | -0.9680 | -0.9350 | -0.9260 | -0.9140 | -0.8300 | -0.7820 | -0.7580 |
| -16.0 | -0.9720 | -0.9720 | -0.9720 | -0.9720 | -0.9700 | -0.9400 | -0.9220 | -0.9080 | -0.9100 | -0.7540 | -0.7260 |
| -14.0 | -1.0700 | -1.0700 | -1.0700 | -1.0700 | -0.8200 | -0.8000 | -0.8050 | -0.8800 | -0.8000 | -0.7260 | -0.6940 |
| -12.0 | -0.7240 | -0.7240 | -0.7240 | -0.7240 | -0.5350 | -0.5250 | -0.6600 | -0.8300 | -0.7900 | -0.6980 | -0.6620 |
| -10.0 | -0.3700 | -0.3700 | -0.3700 | -0.3700 | -0.2400 | -0.4000 | -0.6000 | -0.7800 | -0.8100 | -0.6700 | -0.6300 |
| -8.0 | -0.1900 | -0.1900 | -0.1900 | -0.1900 | -0.3000 | -0.3000 | -0.5500 | -0.7350 | -0.7500 | -0.6650 | -0.6200 |
| -6.0 | -0.3900 | -0.3900 | -0.3900 | -0.3900 | -0.4500 | -0.3200 | -0.5200 | -0.6400 | -0.6900 | -0.6600 | -0.6100 |
| -4.0 | -0.4500 | -0.4500 | -0.4500 | -0.4500 | -0.4200 | -0.4400 | -0.4700 | -0.5900 | -0.4700 | -0.5400 | -0.4250 |
| -2.0 | -0.1900 | -0.1900 | -0.1900 | -0.1900 | -0.1850 | -0.1950 | -0.1950 | -0.2550 | -0.2500 | -0.4100 | -0.2400 |
| 0.0 | 0.0300 | 0.0300 | 0.0300 | 0.0300 | 0.0500 | 0.0500 | 0.0750 | 0.0700 | 0.0800 | -0.1500 | -0.0500 |
| 2.0 | 0.2430 | 0.2430 | 0.2430 | 0.2430 | 0.2800 | 0.2950 | 0.3400 | 0.3950 | 0.3500 | 0.1400 | 0.2000 |
| 4.0 | 0.4600 | 0.4600 | 0.4600 | 0.4600 | 0.5100 | 0.5300 | 0.6130 | 0.7200 | 0.5600 | 0.3900 | 0.4500 |
| 6.0 | 0.6700 | 0.6700 | 0.6700 | 0.6700 | 0.7500 | 0.7800 | 0.8400 | 0.8300 | 0.7050 | 0.6400 | 0.7000 |
| 8.0 | 0.8900 | 0.8900 | 0.8900 | 0.8900 | 0.9800 | 0.9600 | 0.9150 | 0.8770 | 0.9100 | 0.7650 | 0.8000 |
| 10.0 | 1.1000 | 1.1000 | 1.1000 | 1.1000 | 1.1700 | 1.0100 | 0.9470 | 0.9200 | 0.8450 | 0.8100 | 0.8500 |
| 12.0 | 1.2500 | 1.2500 | 1.2500 | 1.2500 | 1.1300 | 0.9600 | 1.0000 | 0.9230 | 0.8450 | 0.8300 | 0.8650 |
| 14.0 | 1.1000 | 1.1000 | 1.1000 | 1.1000 | 1.0300 | 1.0800 | 1.0540 | 0.9300 | 0.8500 | 0.8500 | 0.8800 |
| 16.0 | 0.9800 | 0.9800 | 0.9800 | 0.9800 | 0.9600 | 1.0600 | 1.0800 | 0.9200 | 0.8600 | 0.8700 | 0.8950 |
| 18.0 | 0.9828 | 0.9828 | 0.9828 | 0.9828 | 0.9657 | 1.0700 | 1.0630 | 0.8950 | 0.8800 | 0.8850 | 0.9100 |
| 20.0 | 0.9856 | 0.9856 | 0.9856 | 0.9856 | 0.9714 | 1.0600 | 1.0530 | 0.9000 | 0.9000 | 0.9050 | 0.9250 |
| 22.0 | 0.9884 | 0.9884 | 0.9884 | 0.9884 | 0.9771 | 1.0500 | 1.0420 | 0.9200 | 0.9200 | 0.9250 | 0.9400 |
| 24.0 | 0.9912 | 0.9912 | 0.9912 | 0.9912 | 0.9828 | 1.0350 | 1.0310 | 0.9400 | 0.9400 | 0.9400 | 0.9550 |
| 26.0 | 0.9940 | 0.9940 | 0.9940 | 0.9940 | 0.9885 | 1.0200 | 1.0200 | 0.9700 | 0.9600 | 0.9600 | 0.9700 |
| 28.0 | 0.9970 | 0.9970 | 0.9970 | 0.9970 | 0.9942 | 1.0100 | 1.0100 | 0.9850 | 0.9800 | 0.9800 | 0.9850 |
| 30.0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 32.0 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 | 0.9675 |

Table 9: SC1095 lift coefficient [3]

| α [deg] | C_D | | | | | | | | | | |
|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | Ma=0.0 | Ma=0.1 | Ma=0.2 | Ma=0.3 | Ma=0.4 | Ma=0.5 | Ma=0.6 | Ma=0.7 | Ma=0.8 | Ma=0.9 | Ma=10.0 |
| -32.0 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 |
| -30.0 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 |
| -28.0 | 0.56200 | 0.56200 | 0.56200 | 0.56200 | 0.57000 | 0.56400 | 0.57800 | 0.59000 | 0.59300 | 0.59700 | 0.60100 |
| -26.0 | 0.48800 | 0.48800 | 0.48800 | 0.48800 | 0.51000 | 0.51000 | 0.52500 | 0.54500 | 0.55500 | 0.56300 | 0.57200 |
| -24.0 | 0.41700 | 0.41700 | 0.41700 | 0.41700 | 0.44800 | 0.46500 | 0.46900 | 0.50400 | 0.52000 | 0.53000 | 0.54300 |
| -22.0 | 0.34000 | 0.34000 | 0.34000 | 0.34000 | 0.39000 | 0.40800 | 0.41500 | 0.46000 | 0.47800 | 0.49700 | 0.51400 |
| -20.0 | 0.26700 | 0.26700 | 0.26700 | 0.26700 | 0.33000 | 0.35300 | 0.36100 | 0.41600 | 0.44000 | 0.46300 | 0.48600 |
| -18.0 | 0.19500 | 0.19500 | 0.19500 | 0.19500 | 0.26500 | 0.29600 | 0.32300 | 0.37300 | 0.40300 | 0.43000 | 0.45700 |
| -16.0 | 0.12000 | 0.12000 | 0.12000 | 0.12000 | 0.20800 | 0.24000 | 0.28500 | 0.32900 | 0.36400 | 0.39700 | 0.42800 |
| -14.0 | 0.04500 | 0.04500 | 0.04500 | 0.04500 | 0.16100 | 0.18300 | 0.24600 | 0.28500 | 0.32500 | 0.36300 | 0.39900 |
| -12.0 | 0.01800 | 0.01800 | 0.01800 | 0.01800 | 0.02200 | 0.12000 | 0.19100 | 0.24200 | 0.29000 | 0.33000 | 0.37000 |
| -10.0 | 0.01200 | 0.01200 | 0.01200 | 0.01200 | 0.01300 | 0.06700 | 0.12800 | 0.17700 | 0.22500 | 0.26200 | 0.29700 |
| -8.0 | 0.00800 | 0.00800 | 0.00800 | 0.00820 | 0.00900 | 0.02100 | 0.07000 | 0.11300 | 0.16000 | 0.20300 | 0.24800 |
| -6.0 | 0.00775 | 0.00775 | 0.00775 | 0.00790 | 0.00850 | 0.01000 | 0.02600 | 0.06000 | 0.10000 | 0.14900 | 0.20200 |
| -4.0 | 0.00750 | 0.00750 | 0.00750 | 0.00750 | 0.00800 | 0.00800 | 0.01250 | 0.03000 | 0.06500 | 0.11500 | 0.15200 |
| -2.0 | 0.00750 | 0.00750 | 0.00750 | 0.00750 | 0.00800 | 0.00750 | 0.00850 | 0.01200 | 0.02900 | 0.06600 | 0.11700 |
| 0.0 | 0.00750 | 0.00750 | 0.00750 | 0.00750 | 0.00800 | 0.00750 | 0.00800 | 0.00800 | 0.01700 | 0.05000 | 0.09000 |
| 2.0 | 0.00800 | 0.00800 | 0.00800 | 0.00800 | 0.00820 | 0.00750 | 0.00850 | 0.01000 | 0.04000 | 0.08000 | 0.11750 |
| 4.0 | 0.00850 | 0.00850 | 0.00850 | 0.00850 | 0.00850 | 0.00800 | 0.01100 | 0.03500 | 0.09000 | 0.12000 | 0.15250 |
| 6.0 | 0.00900 | 0.00900 | 0.00900 | 0.00900 | 0.01100 | 0.01100 | 0.02800 | 0.08200 | 0.12800 | 0.16700 | 0.20300 |
| 8.0 | 0.01100 | 0.01100 | 0.01100 | 0.01100 | 0.01400 | 0.02600 | 0.07300 | 0.12600 | 0.17000 | 0.21000 | 0.24900 |
| 10.0 | 0.01700 | 0.01700 | 0.01700 | 0.01700 | 0.02000 | 0.08000 | 0.12200 | 0.16100 | 0.22500 | 0.26200 | 0.29800 |
| 12.0 | 0.02600 | 0.02600 | 0.02600 | 0.02600 | 0.09800 | 0.15300 | 0.17900 | 0.24000 | 0.28500 | 0.32200 | 0.37000 |
| 14.0 | 0.14500 | 0.14500 | 0.14500 | 0.14500 | 0.16900 | 0.21200 | 0.23100 | 0.28000 | 0.32400 | 0.35600 | 0.39900 |
| 16.0 | 0.23000 | 0.23000 | 0.23000 | 0.23000 | 0.23000 | 0.26200 | 0.28300 | 0.32300 | 0.36100 | 0.39000 | 0.42800 |
| 18.0 | 0.29300 | 0.29300 | 0.29300 | 0.29300 | 0.29300 | 0.31600 | 0.32800 | 0.36500 | 0.40000 | 0.42500 | 0.45700 |
| 20.0 | 0.34500 | 0.34500 | 0.34500 | 0.34500 | 0.34500 | 0.36500 | 0.35800 | 0.40800 | 0.43500 | 0.45900 | 0.48600 |
| 22.0 | 0.40000 | 0.40000 | 0.40000 | 0.40000 | 0.40000 | 0.41600 | 0.41200 | 0.45100 | 0.47000 | 0.49300 | 0.51400 |
| 24.0 | 0.45500 | 0.45500 | 0.45500 | 0.45500 | 0.45500 | 0.46900 | 0.46700 | 0.49300 | 0.50800 | 0.52700 | 0.54300 |
| 26.0 | 0.50700 | 0.50700 | 0.50700 | 0.50700 | 0.50700 | 0.52000 | 0.52100 | 0.53500 | 0.54600 | 0.56200 | 0.57200 |
| 28.0 | 0.56000 | 0.56000 | 0.56000 | 0.56000 | 0.56000 | 0.56900 | 0.57600 | 0.57800 | 0.58300 | 0.59600 | 0.60100 |
| 30.0 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 | 0.63000 |
| 32.0 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 | 0.69750 |

Table 10: SC1095 drag coefficient [3]

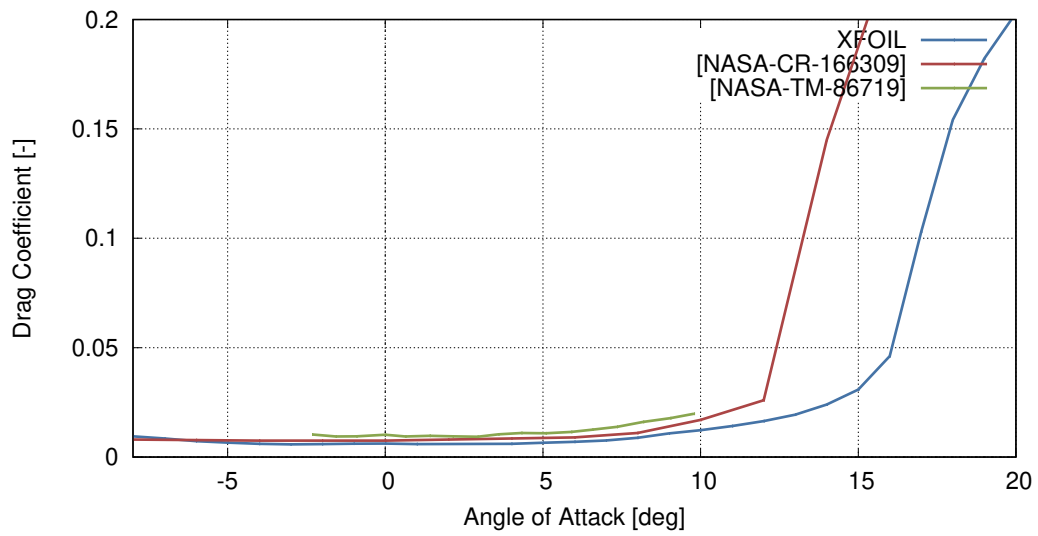


Figure 7: SC1095 drag coefficient

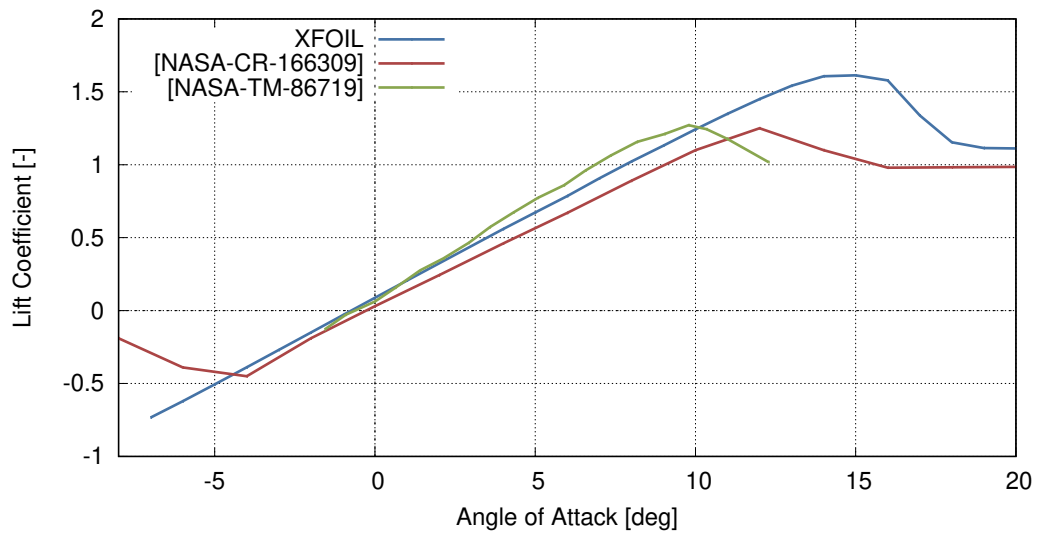


Figure 8: SC1095 lift coefficient

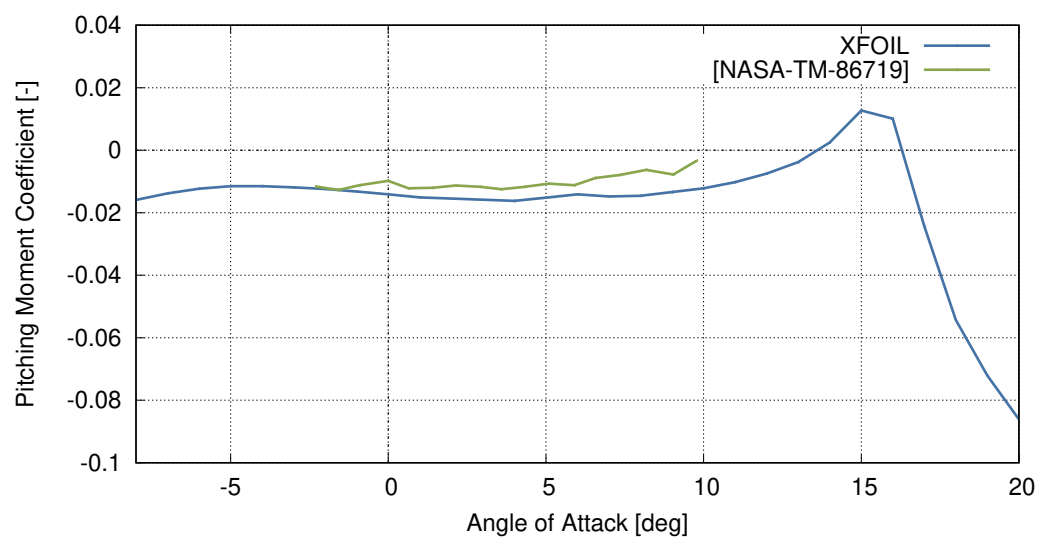


Figure 9: SC1095 pitching moment coefficient

4 Aerodynamic Characteristics

UH-60 aerodynamic characteristics are given in [3].

4.1 Fuselage Aerodynamic Characteristics

| α [deg] | D/q [m ²] | L/q [m ²] | M_Y/q [m ³] |
|-------------------|----------------------------|----------------------------|------------------------------|
| -90.0 | 150.00 | -24.00 | -200.00 |
| -80.0 | 145.00 | -54.00 | -470.00 |
| -70.0 | 133.00 | -72.00 | -645.00 |
| -60.0 | 114.00 | -81.00 | -730.00 |
| -50.0 | 88.00 | -85.00 | -760.00 |
| -40.0 | 61.00 | -83.00 | -760.00 |
| -30.0 | 45.00 | -70.00 | -740.00 |
| -25.0 | 37.58 | -52.00 | -700.00 |
| -20.0 | 31.68 | -35.00 | -630.00 |
| -15.0 | 27.48 | -25.00 | -520.00 |
| -10.0 | 25.06 | -13.00 | -380.00 |
| -5.0 | 23.58 | -5.00 | -230.00 |
| 0.0 | 23.58 | 1.00 | -90.00 |
| 5.0 | 25.08 | 10.00 | 10.00 |
| 10.0 | 27.58 | 20.00 | 100.00 |
| 15.0 | 31.28 | 25.00 | 290.00 |
| 20.0 | 36.58 | 30.00 | 450.00 |
| 25.0 | 43.08 | 34.00 | 600.00 |
| 30.0 | 51.08 | 37.00 | 750.00 |
| 40.0 | 66.00 | 43.00 | 810.00 |
| 50.0 | 84.00 | 48.00 | 825.00 |
| 60.0 | 110.00 | 50.00 | 780.00 |
| 70.0 | 132.00 | 48.00 | 650.00 |
| 80.0 | 145.00 | 39.00 | 470.00 |
| 90.0 | 150.00 | 22.00 | 200.00 |

Table 11: Fuselage aerodynamic characteristics due to angle of attack [3]

| β [deg] | Y/q [m ²] | M_X/q [m ³] | M_Z/q [m ³] |
|------------------|----------------------------|------------------------------|------------------------------|
| -90.0 | 37.00 | 100.00 | 440.00 |
| -80.0 | 64.00 | 100.00 | 392.00 |
| -70.0 | 84.00 | 100.00 | 332.00 |
| -60.0 | 100.00 | 101.00 | 259.00 |
| -50.0 | 103.00 | 103.00 | 160.00 |
| -40.0 | 92.00 | 106.00 | 40.00 |
| -30.0 | 72.00 | 110.00 | -140.00 |
| -25.0 | 65.00 | 120.00 | -190.00 |
| -20.0 | 50.00 | 75.00 | -240.00 |
| -15.0 | 35.00 | 30.00 | -220.00 |
| -10.0 | 23.00 | 0.00 | -180.00 |
| -5.0 | 11.00 | 0.00 | -100.00 |
| 0.0 | 0.00 | 0.00 | 0.00 |
| 5.0 | -11.00 | 0.00 | 100.00 |
| 10.0 | -23.00 | 0.00 | 180.00 |
| 15.0 | -35.00 | -30.00 | 220.00 |
| 20.0 | -50.00 | -75.00 | 240.00 |
| 25.0 | -65.00 | -120.00 | 190.00 |
| 30.0 | -72.00 | -110.00 | 140.00 |
| 40.0 | -92.00 | -106.00 | 59.00 |
| 50.0 | -103.00 | -103.00 | -30.00 |
| 60.0 | -100.00 | -101.00 | -125.00 |
| 70.0 | -84.00 | -100.00 | -220.00 |
| 80.0 | -64.00 | -100.00 | -320.00 |
| 90.0 | -37.00 | -100.00 | -420.00 |

Table 12: Fuselage aerodynamic characteristics due to sideslip [3]

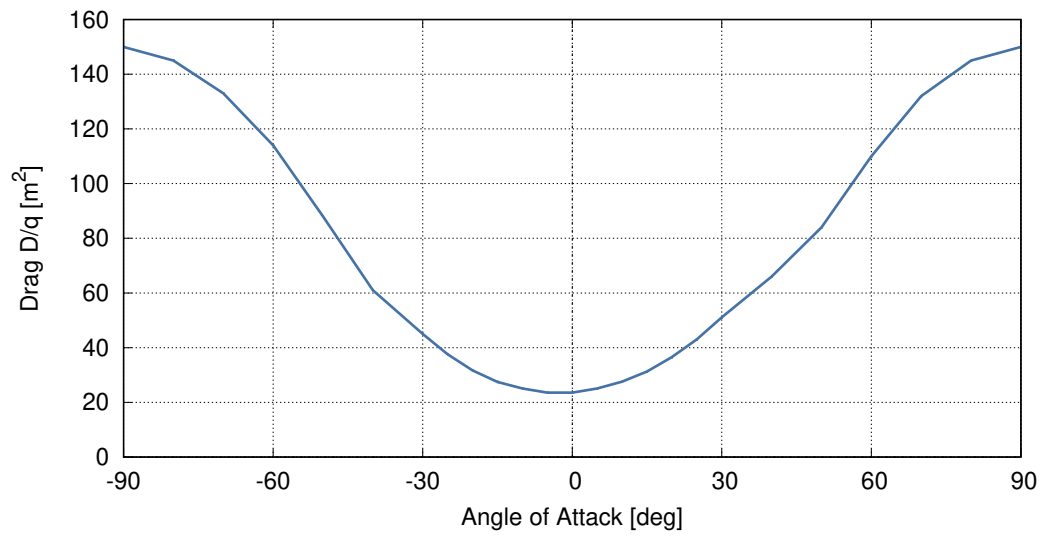


Figure 10: Fuselage drag due to angle of attack [3]

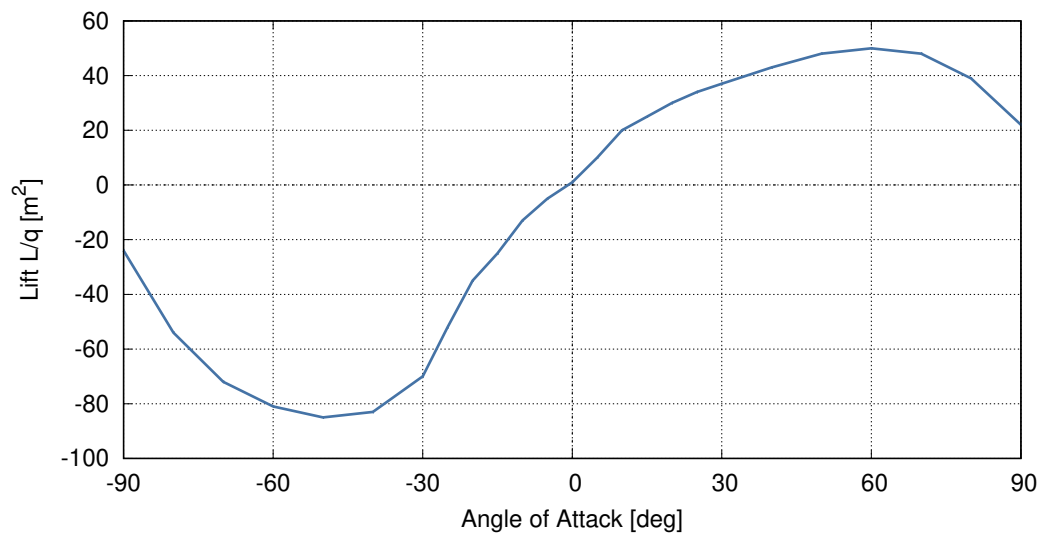


Figure 11: Fuselage lift due to angle of attack [3]

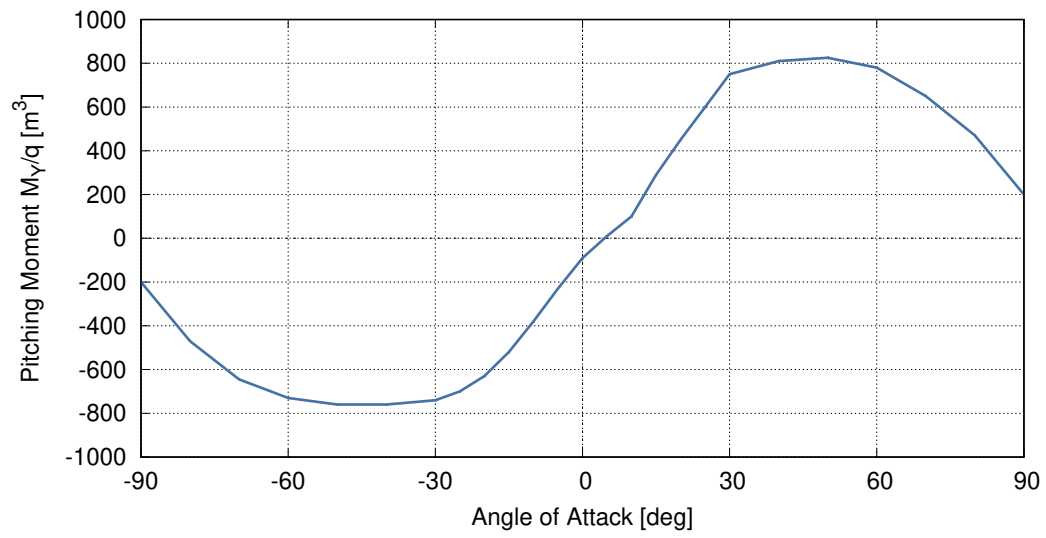


Figure 12: Fuselage pitching moment due to angle of attack [3]

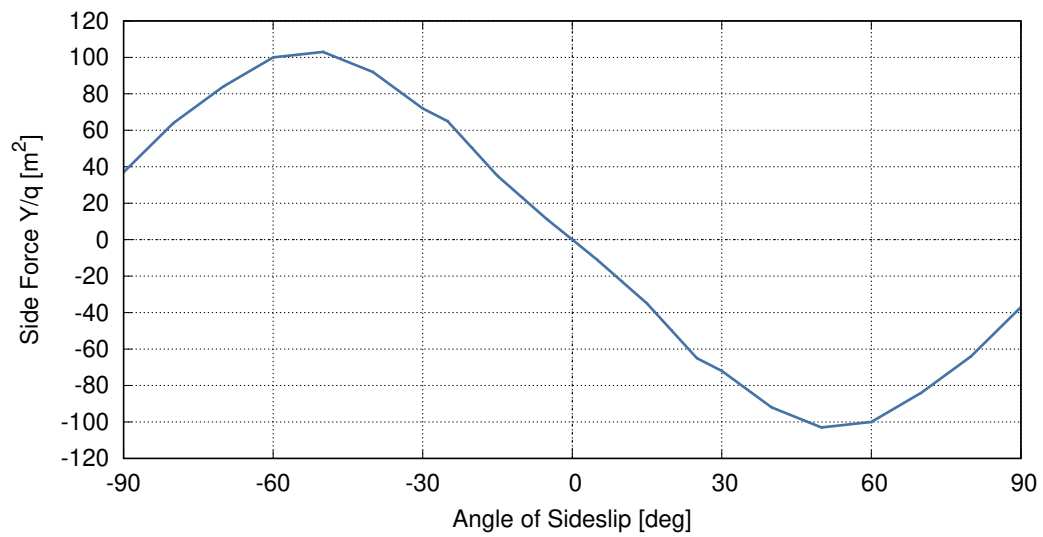


Figure 13: Fuselage side force due to sideslip [3]

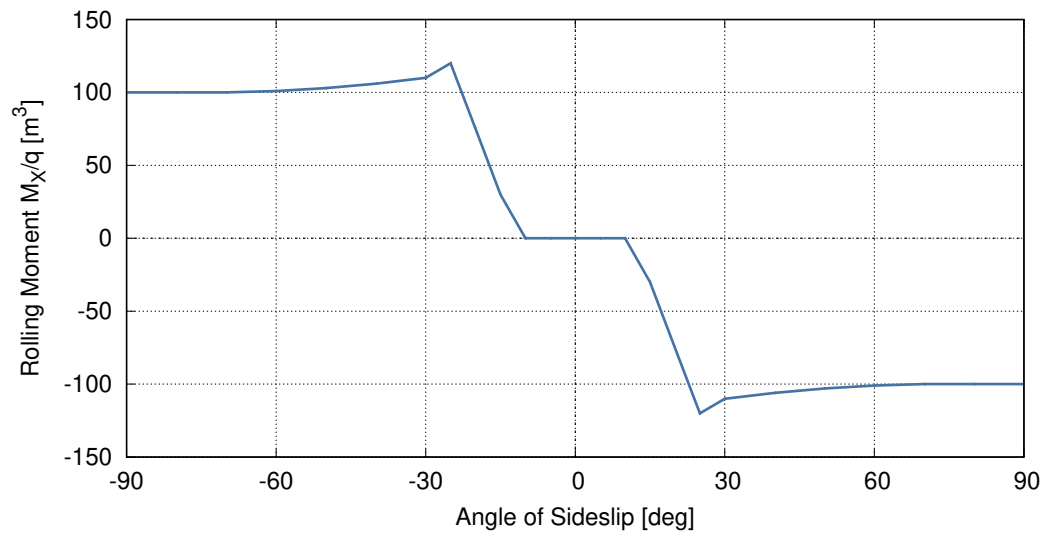


Figure 14: Fuselage rolling moment due to sideslip [3]

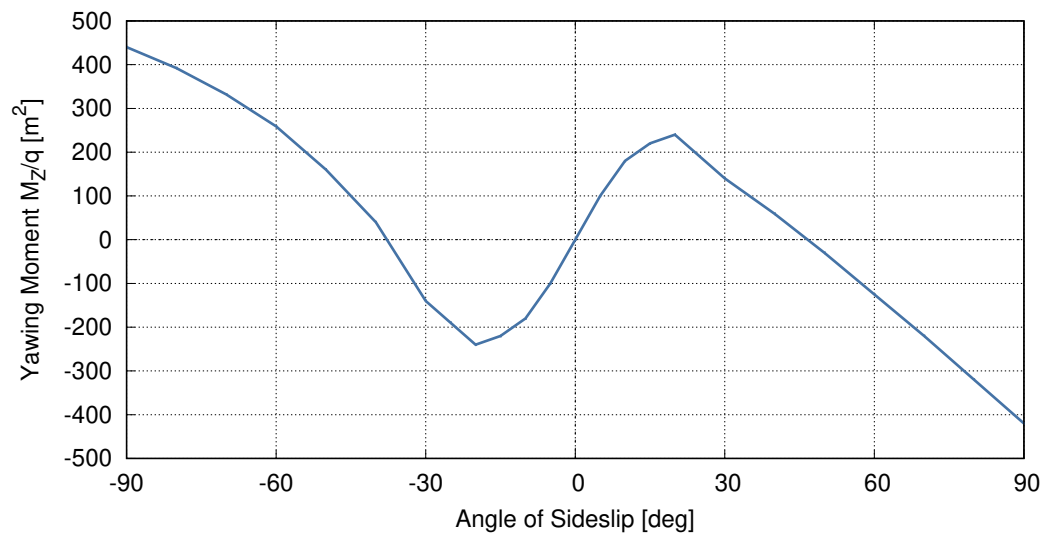


Figure 15: Fuselage yawing moment due to sideslip [3]

4.2 Fuselage Incremental Aerodynamic Characteristics

| β [deg] | $\Delta D/q$ [m ²] | $\Delta L/q$ [m ²] | $\Delta M_Y/q$ [m ³] |
|------------------|-----------------------------------|-----------------------------------|-------------------------------------|
| -90.0 | 170.50 | | |
| -80.0 | 169.50 | | |
| -70.0 | 164.50 | | |
| -60.0 | 141.50 | | |
| -50.0 | 113.50 | | |
| -40.0 | 76.50 | | |
| -30.0 | 38.50 | 30.00 | 180.00 |
| -25.0 | 28.00 | 20.00 | 130.00 |
| -20.0 | 16.30 | 12.00 | 90.00 |
| -15.0 | 9.00 | 7.00 | 50.00 |
| -10.0 | 4.00 | 3.00 | 20.00 |
| -5.0 | 1.00 | 2.00 | 10.00 |
| 0.0 | 0.00 | 0.00 | 0.00 |
| 5.0 | 1.00 | 2.00 | 10.00 |
| 10.0 | 4.00 | 5.00 | 20.00 |
| 15.0 | 9.00 | 10.00 | 50.00 |
| 20.0 | 16.30 | 15.00 | 90.00 |
| 25.0 | 28.00 | 22.00 | 130.00 |
| 30.0 | 38.50 | 30.00 | 180.00 |
| 40.0 | 76.50 | | |
| 50.0 | 113.50 | | |
| 60.0 | 141.50 | | |
| 70.0 | 164.50 | | |
| 80.0 | 169.50 | | |
| 90.0 | 170.50 | | |

Table 13: Fuselage incremental aerodynamic characteristics [3]

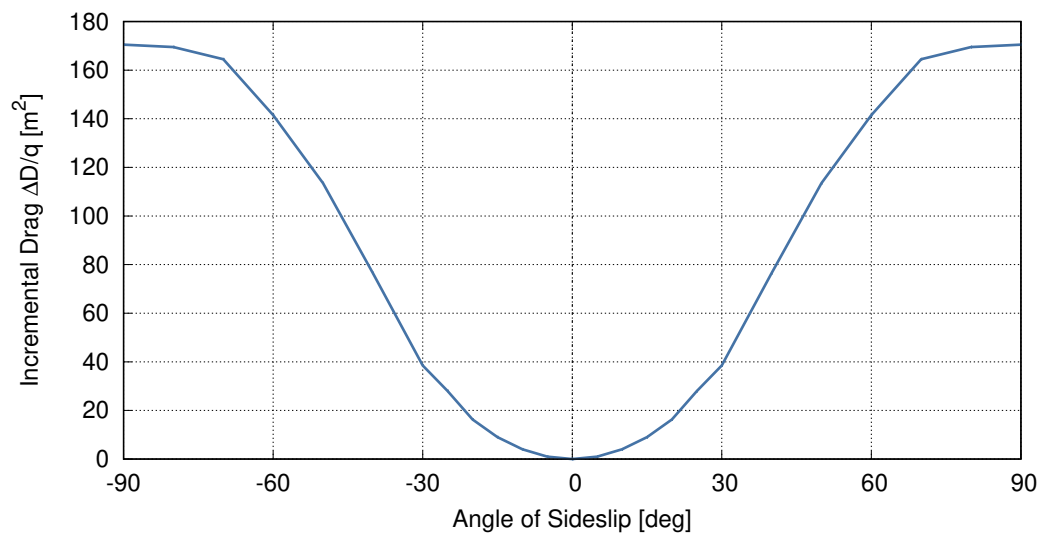


Figure 16: Fuselage incremental drag due to sideslip [3]

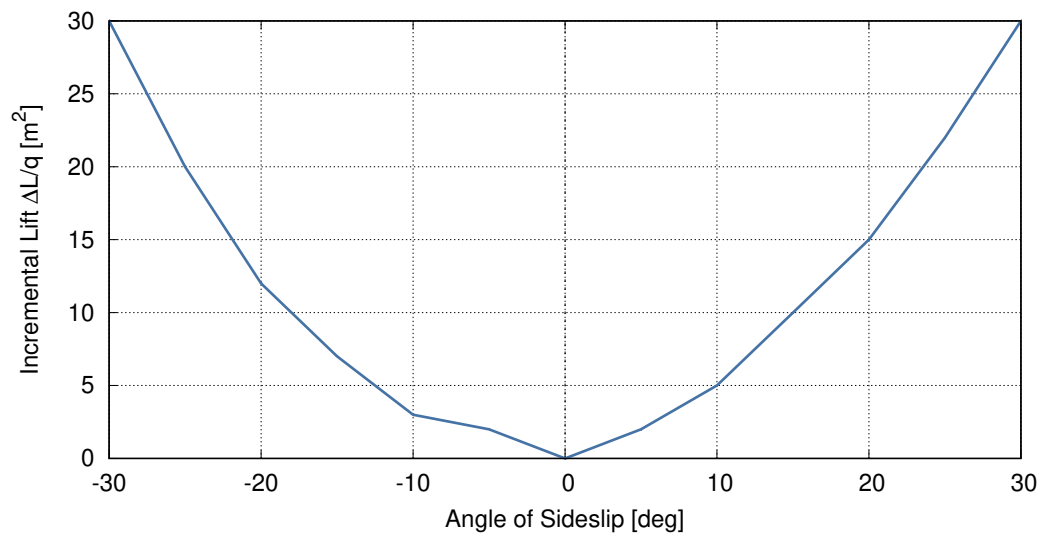


Figure 17: Fuselage incremental lift due to sideslip [3]

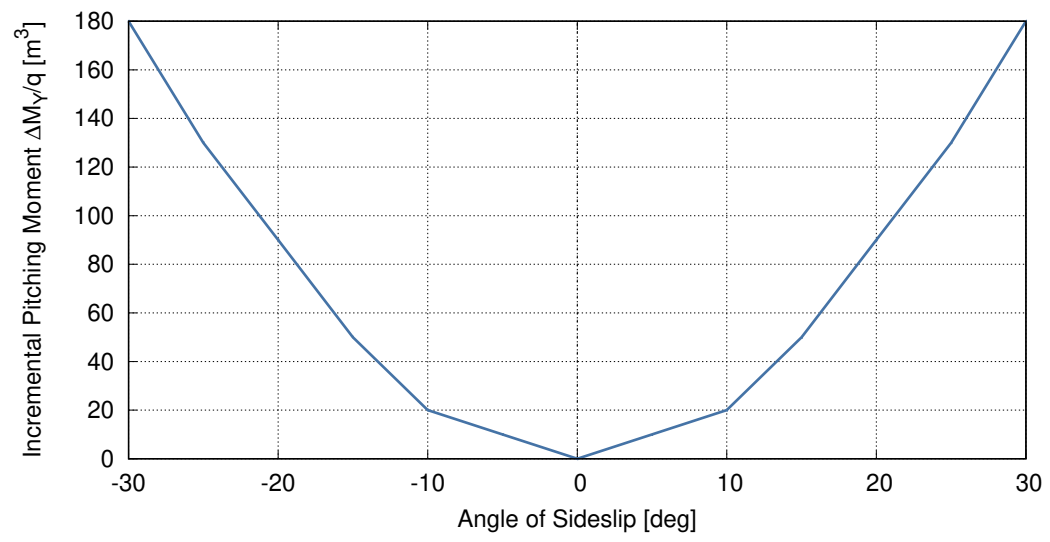


Figure 18: Fuselage incremental pitching moment due to sideslip [3]

4.3 Horizontal Tail Aerodynamic Coefficients

Horizontal tail reference area: 4.18 [m²]

| α [deg] | $C_{X,h}$ [-] | $C_{Z,h}$ [-] |
|-------------------|------------------|------------------|
| -90 | 1.200 | 0.000 |
| -80 | 1.161 | -0.294 |
| -70 | 1.050 | -0.558 |
| -60 | 0.888 | -0.745 |
| -50 | 0.702 | -0.847 |
| -40 | 0.531 | -0.847 |
| -30 | 0.430 | -0.745 |
| -25 | 0.370 | -0.795 |
| -20 | 0.360 | -0.950 |
| -15 | 0.190 | -1.030 |
| -10 | 0.040 | -0.710 |
| -5 | 0.022 | -0.356 |
| 0 | 0.010 | 0.000 |
| 5 | 0.022 | 0.356 |
| 10 | 0.040 | 0.710 |
| 15 | 0.190 | 1.030 |
| 20 | 0.360 | 0.950 |
| 25 | 0.370 | 0.795 |
| 30 | 0.430 | 0.745 |
| 40 | 0.531 | 0.847 |
| 50 | 0.702 | 0.847 |
| 60 | 0.888 | 0.745 |
| 70 | 1.050 | 0.558 |
| 80 | 1.161 | 0.294 |
| 90 | 1.200 | 0.000 |

Table 14: Horizontal tail aerodynamic coefficients [3]

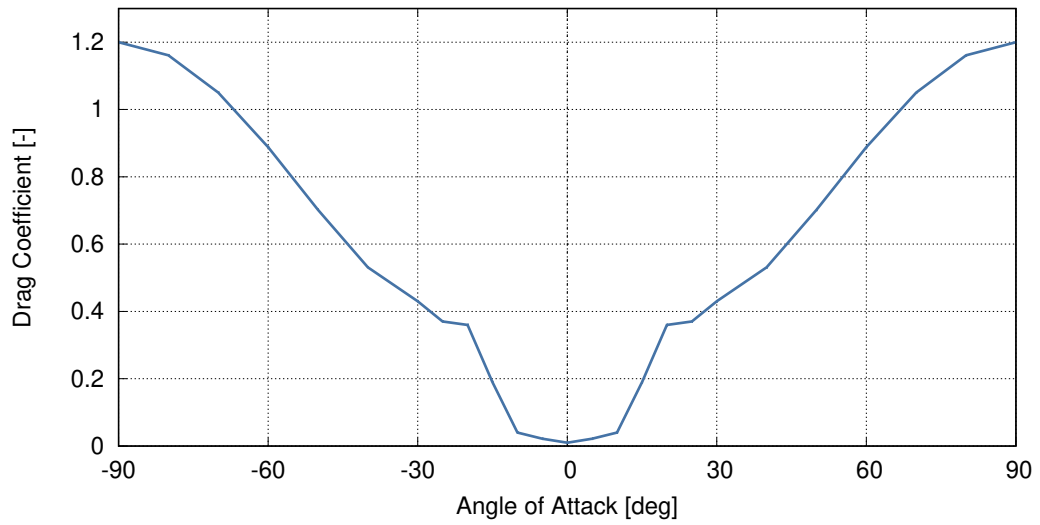


Figure 19: Horizontal tail drag coefficient due to angle of attack [3]

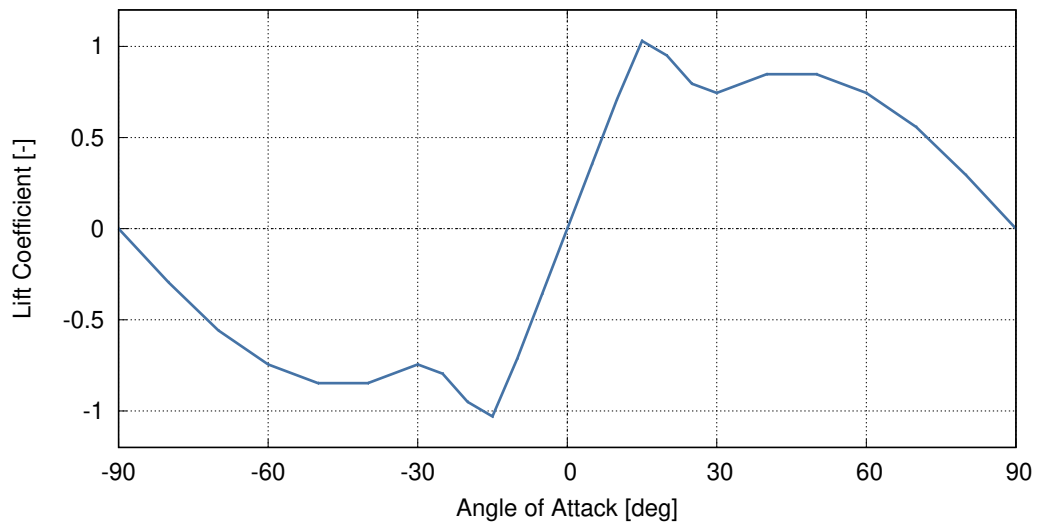


Figure 20: Horizontal tail lift coefficient due to angle of attack [3]

4.4 Vertical Tail Aerodynamic Coefficients

Vertical tail reference area: 3.00 [m²]

| β [deg] | $C_{X,v}$ [-] | $C_{Y,v}$ [-] |
|------------------|------------------|------------------|
| -90 | 1.080 | 0.000 |
| -80 | 1.020 | 0.170 |
| -70 | 0.966 | 0.320 |
| -60 | 0.875 | 0.480 |
| -50 | 0.750 | 0.630 |
| -40 | 0.580 | 0.800 |
| -30 | 0.355 | 0.890 |
| -25 | 0.248 | 0.890 |
| -20 | 0.162 | 0.820 |
| -15 | 0.092 | 0.610 |
| -10 | 0.044 | 0.380 |
| -5 | 0.021 | 0.160 |
| 0 | 0.018 | -0.060 |
| 5 | 0.033 | -0.280 |
| 10 | 0.066 | -0.500 |
| 15 | 0.118 | -0.730 |
| 20 | 0.174 | -0.930 |
| 25 | 0.265 | -1.000 |
| 30 | 0.360 | -1.000 |
| 40 | 0.575 | -0.880 |
| 50 | 0.745 | -0.660 |
| 60 | 0.875 | -0.460 |
| 70 | 0.965 | -0.280 |
| 80 | 1.025 | -0.120 |
| 90 | 1.100 | 0.000 |

Table 15: Vertical tail aerodynamic coefficients [3]

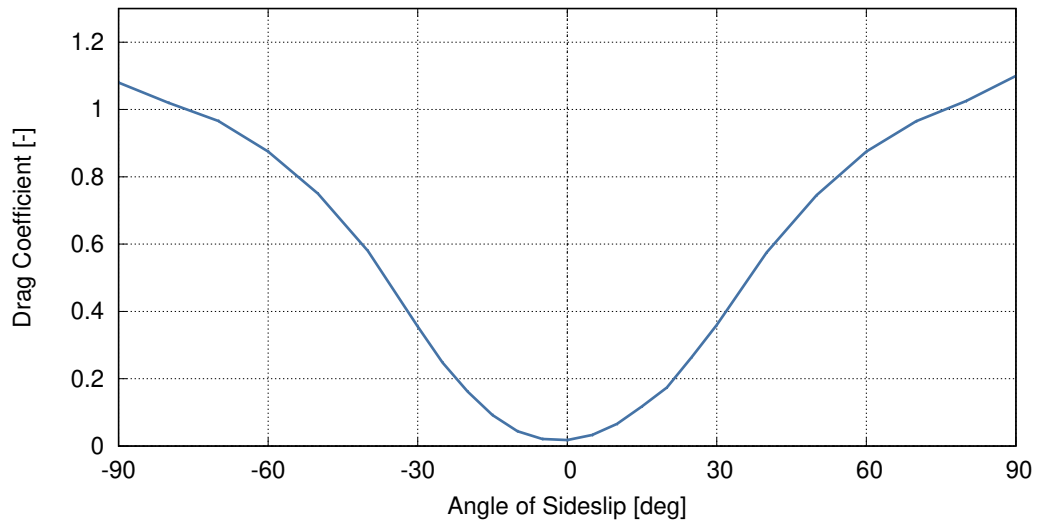


Figure 21: Vertical tail drag coefficient due to sideslip [3]

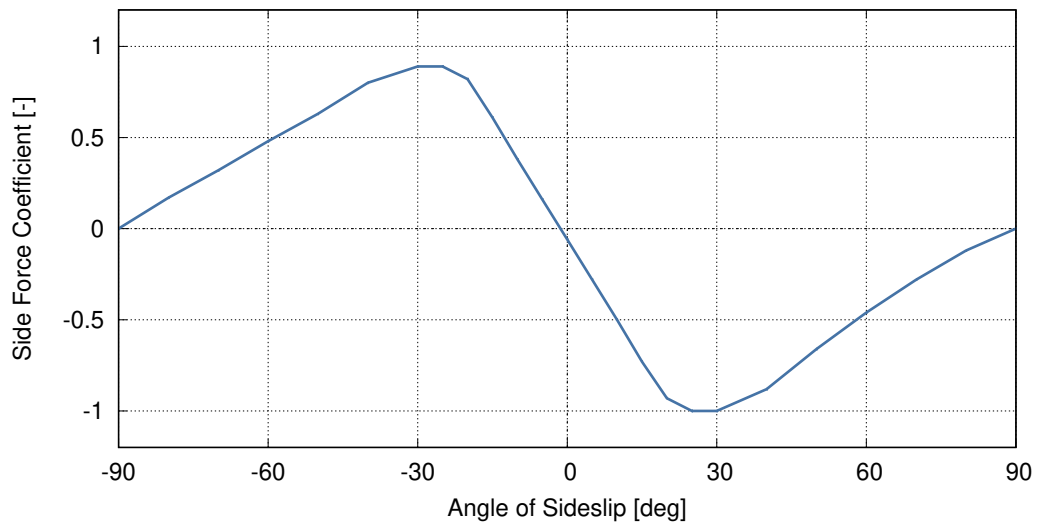


Figure 22: Vertical tail side force coefficient due to sideslip [3]

5 Mass Data

Data given in [2, 3, 6] were used to calculate empty aircraft inertia tensor and center of mass coordinates. Results are given in the following table.

| Parameter | Value |
|-----------------------------------|----------------------------|
| Center of mass x-coordinate | -0.15 m |
| Center of mass y-coordinate | 0.00 m |
| Center of mass z-coordinate | -0.25 m |
| Moment of inertia I_X | 6 543.0 kg·m ² |
| Moment of inertia I_Y | 46 293.1 kg·m ² |
| Moment of inertia I_Z | 43 498.3 kg·m ² |
| Cross product of inertia I_{XY} | 0.0 kg·m ² |
| Cross product of inertia I_{XZ} | -3 753.0 kg·m ² |
| Cross product of inertia I_{YZ} | 0.0 kg·m ² |

Table 16: Empty aircraft inertia tensor and center of mass coordinates

| Structure group | Weight [kg] | Coordinates [m] | | | First moment of mass [kg·m] | | | Moment of inertia [kg·m ²] | | | | | | |
|---------------------|----------------|--------------------|----------|----------|--------------------------------|----------------------|----------------------|---|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| | | <i>m</i> | <i>x</i> | <i>y</i> | <i>z</i> | <i>S_X</i> | <i>S_Y</i> | <i>S_Z</i> | <i>I_X</i> | <i>I_Y</i> | <i>I_Z</i> | <i>I_{XY}</i> | <i>I_{XZ}</i> | <i>I_{YZ}</i> |
| Empty aircraft | 5118 | | -0.15 | 0.00 | -0.25 | -791.9 | 0.0 | -1274.0 | 6543.0 | 46 293.1 | 43 498.3 | 0.0 | -3753.0 | 0.0 |
| Pilot (left) | 80 | | 2.90 | -0.70 | 0.40 | 232.0 | -56.0 | 32.0 | 52.0 | 685.6 | 712.0 | 162.4 | -92.8 | 22.4 |
| Pilot (right) | 80 | | 2.90 | 0.70 | 0.40 | 232.0 | 56.0 | 32.0 | 52.0 | 685.6 | 712.0 | -162.4 | -92.8 | -22.4 |
| Fuel | 1100 | | -2.02 | 0.00 | 0.70 | -2222.0 | 0.0 | 770.0 | 539.0 | 5027.4 | 4488.4 | 0.0 | 1555.4 | 0.0 |
| Personnel (4th row) | 440 | | 0.04 | 0.00 | 0.50 | 15.6 | 0.0 | 220.0 | 110.0 | 110.6 | 0.6 | 0.0 | -7.8 | 0.0 |
| Personnel (5th row) | 440 | | -1.17 | 0.00 | 0.50 | -514.1 | 0.0 | 220.0 | 110.0 | 710.7 | 600.7 | 0.0 | 257.0 | 0.0 |
| Gross weight | 7258 | | -0.42 | 0.00 | 0.00 | -3048.4 | 0.0 | 0.0 | 7406.0 | 53 513.0 | 50 012.0 | 0.0 | -2134.0 | 0.0 |

Table 17: Mass data intermediate results

References

- [1] P. Jackson, *Jane's All the World's Aircraft 2004-2005*. Jane's Information Group, 2004.
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- [7] "T700-401C/-701C turboshaft engines," 2014. [Accessed 2020-02-01]. Available from: <https://www.geaviation.com/sites/default/files/datasheet-T700-401C-701C.pdf>.
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