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## ERRATA – CORRIGE

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Like most textbooks, the first printing of “Principles of Helicopter Aerodynamics” has its own share of unresolved typographical and author errors that could not be fixed before going to press. Listed below are the pertinent changes, which will appear on the second printing.

Page 13 - last paragraph, 2nd line. Replace: “1934” by: “1928”.

Page 23 - 3rd line. Replace: “211 model” by: “212 model”.

Page 25 - 3rd paragraph, 6th line. Replace: “1957” by” “1951”.

Page 33 - 2nd paragraph, 4th line. The words “misplaced modifier” are a typesetter error. The sentence should read: “In hovering flight, the velocity variation along the blade ... etc.”

Page 44 - The line after Eq. 2.28 should read: “so that based on momentum theory the power coefficient for the hovering rotor is”

Page 48 - Section 2.2.10, end of first paragraph. Replace by: “...reduction in the rotor disk area by a factor  $B^2$ ,”

Page 48 - Footnote to Section 2.1.10: “Note that tip loss effects account for one source of nonuniform inflow in the factor  $\kappa$ .”

Page 50 - Last paragraph, 3rd line. Replace”: “Eq. 2.10” by: “Eq. 2.39”.

Page 58 - The last term in Equation 2.78 has a typographical error; the last term in the equation should be deleted. The complete Eq. 2.78 should read:

$$\begin{aligned} \frac{V_c + v_i}{v_h} &= \frac{P_{\text{meas}} - P_0}{P_h} = \frac{P_{\text{meas}} - P_0}{T \sqrt{T/2\rho A}} \\ &= \frac{C_{P_{\text{meas}}} - C_{P_0}}{C_T^{3/2}/\sqrt{2}} \end{aligned} \quad (2.78)$$

Page 58 - Equation 2.79 has a typographical error in the denominator of the first term (should be  $v_h$  not  $V_c$ ). The complete equation is:

$$\frac{v_i}{v_h} = \kappa - \frac{V_c}{v_h} \quad \text{for } 0 \leq \frac{V_c}{v_h} \leq -1.5 \quad (2.79)$$

Also, the first term in Eqs. 2.80 and 2.81 are typesetting errors and should not be printed. The correct equations are:

$$\frac{v_i}{v_h} = \kappa \left[ 7 + 3 \frac{V_c}{v_h} \right] \quad \text{for } -1.5 \leq \frac{V_c}{v_h} \leq -2 \quad (2.80)$$

$$\frac{v_i}{v_h} = \kappa + k_1 \left( \frac{V_c}{v_h} \right) + k_2 \left( \frac{V_c}{v_h} \right)^2 + k_3 \left( \frac{V_c}{v_h} \right)^3 + k_4 \left( \frac{V_c}{v_h} \right)^4 \quad (2.81)$$

Page 62 - Equation 2.88. No minus sign before right-hand side.

Page 63 - Figure 2.17. The angle between the rotor thrust vector,  $T$ , and the rotor lift vector,  $L$ , should be  $\alpha$  *minus* the flight path angle, the latter which is the angle between  $V_\infty$  and the horizontal

reference. The angle equals  $\alpha$  only in straight-and-level flight.

Page 71 - Equations 2.128 and 2.129 have a typographical error. These should read:

$$P = \frac{\kappa T^{3/2}}{\sqrt{2\rho A}} + \rho A (\Omega R)^3 \left( \frac{\sigma C_{d_0}}{8} \right) \quad (2.128)$$

$$P = \frac{\kappa_{\text{int}} \kappa (2T)^{3/2}}{\sqrt{2\rho A}} + \rho A (\Omega R)^3 \left( \frac{2\sigma C_{d_0}}{8} \right) \quad (2.129)$$

Page 72 - Equation 2.133 should read:

$$P_i = \kappa_{ov} \kappa T \sqrt{\frac{T}{4\rho A}} \quad (2.133)$$

Page 86 - Text before Eq. 3.37: For untwisted blades and uniform inflow, the thrust becomes

$$C_T = \frac{1}{2} C_{l_\alpha} \left[ \frac{\theta_0}{3} - \frac{\lambda}{2B} \right] \quad (3.37)$$

Page 86 - The second term in Eq. 3.39 has a typographical error. The equation should read:

$$C_{P_i} = \int_{r=0}^{r=1} \lambda dC_T = \int_0^1 \frac{1}{2} \sigma \lambda C_{l_\alpha} r^2 dr \quad (3.39)$$

Page 86 - Before Eq. 3.40. Replace by: “For untwisted blades and  $\lambda = \kappa \sqrt{C_T/2}$  then”

Page 102 - The results in Fig. 3.14 were computed using  $C_{d_0} = 0.011$ ,  $d_1 = 0.02$  and  $d_2 = 0.4$ .

Page 105 - Equation 3.120 should read:

$$FM = \frac{\frac{C_T^{3/2}}{\sqrt{2}}}{\frac{\kappa C_T^{3/2}}{\sqrt{2}} + \left[ \frac{\sigma C_{d_0}}{8} + \left( \frac{2d_1}{3C_{l_\alpha}} \right) C_T + \left( \frac{4d_2}{\sigma C_{l_\alpha}^2} \right) C_T^2 \right]}. \quad (3.120)$$

Note that for illustration, the profile power term in Eq. 3.120 is based on the assumption of an ideal hovering rotor.

Page 109 - Equation 3.129 has a typesetter error; the last term should not be printed. The complete equation should read:

$$C_{l_\alpha} = \frac{C_{l_\alpha}|_{M=0.1}}{\sqrt{1 - (r_e M_{\text{tip}})^2}} \quad (3.129)$$

Page 112 - After Eq. 3.146, the text should read: “which is a good 2-5% higher than for a rectangular rotor...etc.”

Page 113 - Equation 3.151 has a typesetter error. The equation should read:

$$FM = \frac{\lambda_h C_T}{\kappa \lambda_h C_T + \sigma C_{d_0}/8} = \frac{1}{\kappa + \frac{3}{4} [(C_{d_0}/\bar{C}_L)/\lambda_h]} \quad (3.151)$$

Page 118 - Equation 3.173 should read:

$$\lambda_i = \left( \frac{2C_T}{\mu} \right) \left[ \frac{c_0}{2} + \sum_{n=1}^{\infty} (-1)^n c_n(r, \alpha) \cos n\psi \right] \quad (3.173)$$

Page 130 - In Fig. 4.2, subfigure (c), caption should read “Boeing CH-46”.

Page 137 - Equation 4.42 has a typographical error. No square on second  $U_T/\Omega R$  term inside brackets.

Page 142 - Equation 4.62 has a typographical error. In the first term, the denominator should have a  $v_\beta$  not a  $\gamma_\beta$ .

Page 157 - The equation in Question 4.7 has a typographical error. It should read:

$$\tan \phi = \frac{\gamma}{8} \left( \frac{1}{v_\beta^2 - 1} \right)$$

Page 161 - Equation 5.7 has a typographical error in the first term on the numerator of the left-hand-side. The equation should be:

$$\frac{P_h + \Delta P}{P_h} = \frac{V_c}{2v_h} + \sqrt{\left( \frac{V_c}{2v_h} \right)^2 + 1} \approx \frac{V_c}{2v_h} + 1 \quad \text{for low rates of climb} \quad (5.7)$$

Pages 173 & 181 - Equation 5.47 and various locations on p. 181. Substitute  $V_{mr}$  for  $V_y$ .

Page 174 - Equations 5.49 and 5.50 contain typographical errors and should read:

$$R = W_F \left[ \frac{V}{P \times (SFC)} \right]_{W_{GTOW} - W_F/2} \quad (5.49)$$

$$E = W_F \left[ \frac{1}{P \times (SFC)} \right]_{W_{GTOW} - W_F/2} \quad (5.50)$$

Page 195 - Sentence after Eq. 6.2, replace the word: “minimize” by: “maximize”. Also, in Eq. 6.3, drop first term to read:

$$\frac{P}{T} \propto \frac{DL}{FM} \quad (6.3)$$

Page 202-203 - Last sentence on p. 202 to top of p. 203. The sentence should read: “The modified results are based on nonuniform inflow with  $\kappa = 1.25$ , and a higher order approximation for the profile power...etc.”

Page 218 - Figure 6.22 and Equation 6.19 are missing fuselage width,  $w$ , i.e., Eq. 6.19 should be:

$$dD_v = \frac{1}{2} \rho v^2 C_{D_v} w dl \quad (6.19)$$

Page 220 - Last paragraph, 2nd sentence. An editing problem resulted in a change in the meaning of the sentence. Replace by "...where the main rotor wake may suddenly move forward over the empennage location and so produce...etc."

Page 228 - Figure 6.27, caption (a) should read UH-60 not CH-53.

Page 230 - Equation 6.27 should read:

$$\frac{T_{fan}}{T} = \frac{\frac{1}{2}\rho A w^2}{\rho A v_i w} = \frac{w}{2v_i} = \frac{1}{2a_d} \quad (6.27)$$

Pages 251 and Eq. 7.22 - Replace all  $M_c$  by  $M^*$ .

Page 277 - Figure 7.29, last item in legend on graph should read:  $t/c = 18\%$ .

Page 285 - Last paragraph, last line. Replace: "...lower drag divergence...etc." with: "...higher drag divergence...etc."

Page 295 - Equation 7.95 should read:

$$C_d = D + E \cos 2(\alpha - \alpha_0) \quad (7.95)$$

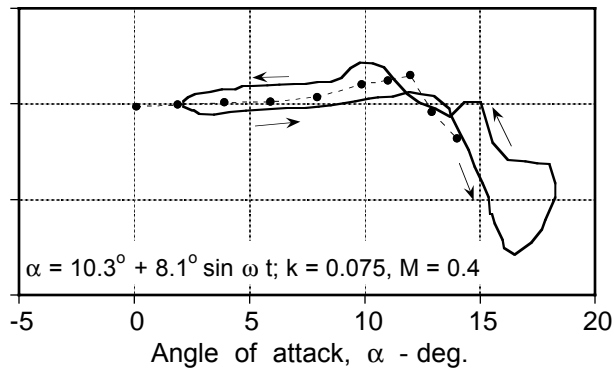
Page 297 - Question 7.6. First sentence: "Test results for a new helicopter airfoil...etc." In the table associated with Question 7.6, entries for  $M_\infty = 0.7$  have typesetter errors. For  $\alpha = -1.5$ ,  $C_n = -0.045$ , and in the next column  $\alpha = -3.0$ ,  $C_m = -0.0243$ .

Page 305 - Figure 8.3. Angular velocity direction about shaft is reversed.

Page 316 - Before Eq. 8.29. Text should read: "In this case, the lift coefficient for pitching about the 1/4-chord is"

Page 334 - Last paragraph, line 11. Replace: "...described by Eq. 8.65..." by the text: "...described by Eq. 8.64..."

Page 385 - Figure 9.4, lower rightmost subfigure for  $C_m$  versus  $\alpha$  for  $\alpha = 10.3^\circ + 8.1^\circ \sin \omega t$  has a typographical error in the direction of the arrows on the hysteresis loop. The figure should be:



Page 388 - Second paragraph, line 13. Replace: "There is also a large clockwise loop...etc." by the text: "There is now another large counterclockwise loop introduced into the moment curve, which gives a return to high torsional aerodynamic damping."

Page 398 - Terms in Eqs. 9.6 and 9.7 should have positive signs not negative signs.

Page 445 - Second line after Eq. 10.33. Replace: "cones" by: "cores".

Page 487 - Table A.2, entry for SA 365 should have  $N_b = 11$ .