

# *Mission Geometry; Orbit and Constellation Design and Management*

1<sup>st</sup> Edition

Errata as of December 16, 2014

The following errata are provided to keep this volume as useful as possible. We would appreciate any other corrections or suggestions being reported to:

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## ERRATA

PAGE	FIRST PRINTING
Inside Front Cover	1 <sup>st</sup> table, 3 <sup>rd</sup> row, 3 <sup>rd</sup> column: Permittivity of vacuum value should read $1/\mu_0 c^2 = 8.854\ 187\ 817 \times 10^{-12}$
51	In Table 2-4, “Eccentricity” row, “Hyperbola” column: equation should read $e = \sqrt{a^2 + b^2}/a \quad e > 1$
51	In Table 2-4, “Mean Angular Motion” row, “Parabola” column: equation should read $n = 2\sqrt{\mu/p^3}$
51	In Table 2-4, footnote: “App. C” should read “App. D”
67	In Eq. (2-29): “10 <sup>-8</sup> ” should read “10 <sup>-6</sup> ”
69	In Eq. (2-33), last term: “. . . + e / 2 (I <sub>0</sub> + I <sub>1</sub> )” should read “. . . + e (I <sub>0</sub> + I <sub>2</sub> ) / 2”
69	In Eq. (2-35): “-6π” should read “-6π <sup>2</sup> ”
81	In Eq. (2-52a): “P <sub>E</sub> ” should read “R <sub>E</sub> ”
84	4 <sup>th</sup> paragraph, 5 <sup>th</sup> line: “Eq. (2-45)” should read “Eq. (2-54)”
99	In Table 2-18, 2 <sup>nd</sup> column heading: “m/s” should read “km/s”
99	In Table 2-18, 1 <sup>st</sup> row: “300 km” should read “250 km” and “7.696” should read “7.730”
102	In Eq. (2-85a), numerator: “2(R <sub>E</sub> - H <sub>e</sub> )” should read “2(R <sub>E</sub> + H <sub>e</sub> )”
109	In Eq. (2-102a): “r” should read “V” on both sides of the equation
109	In Eq. (2-103), top left-hand term: “cos Ω sin ω . . .” should read “cos Ω cos ω . . .”
185	In Eq. (4-5b), “- TRUNC (3 × (TRUNC(Y + 4,900 + C) / 100) / 4)” should read “- TRUNC (3 × (TRUNC ((Y + 4,900 + C) / 100)) / 4)”
197	In Eq. (4-13): “[GHA* - RA*]” should read “[GHA* + RA*]”
197	Last paragraph, last line: “July 4, 2026” should read “July 4, 1976”
197	Example at bottom of page, 2 <sup>nd</sup> line: “2026” should read “1976” 3 <sup>rd</sup> line: “2026” should read “1976” 4 <sup>th</sup> line: “2000” should read “1990”
200	In Table 4-6, middle column, 1 <sup>st</sup> row: the term “≈1/2” should read “≈1/2 (v <sup>2</sup> /c <sup>2</sup> )”
208	In Table 4-9, 1 <sup>st</sup> column, last row: “altitude” should read “attitude”
254	In Table 5-7, 3 <sup>rd</sup> column, 2 <sup>nd</sup> row: “Dh” should read “Δh”
260	In Table 5-9, 3 <sup>rd</sup> column: all refs to “Sec. 5.4.1” should read “App. C.1” “Sec. 5.4.2” should read “App. C.2” “Sec. 5.4.3” should read “App. C.3” “Sec. 5.4.4” should read “App. C.4”
261	In Table 5-10, 2 <sup>nd</sup> column, 1 <sup>st</sup> row: “Table 5.4-1” should read “Table 5-9”

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261	In Table 5-10, 3 <sup>rd</sup> column: all refs to “Sec. 5.4.1” should read “App. C.1” “Sec. 5.4.3” should read “App. C.3”
389	In Fig. 8-7: exchange “S1” and “S2”
390	In Table 8-5, 4 <sup>th</sup> bullet, 1 <sup>st</sup> line: “acos2 [cos (φ), -H (φ)]” should read : “acos2 [-cos (φ),H (φ)]”
390	Eq. (8-4b) should read $A = \text{acos} 2 \left[ \frac{\cos a - \cos b \cos c}{\sin b \sin c} \right], H(a)$
390	In Eq. (8-4c) should read $B = \text{acos} 2 \left[ \frac{\cos b - \cos a \cos c}{\sin a \sin c} \right], H(b)$
396	1 <sup>st</sup> paragraph, 12 <sup>th</sup> line: “Fig. 8-8” should read “Fig. 8-10”
403	In Table 8-8, 4 <sup>th</sup> column, 1 <sup>st</sup> row: “Fig. 8-13” should read “Fig. 8-11”
403	In Table 8-8, 2 <sup>nd</sup> column, 5 <sup>th</sup> row: last term of equation “Δa” should read “Δα”
412	1 <sup>st</sup> paragraph, last sentence should read “...and one at 11,000 km.” not “...and a GPS satellite at approximately half geosynchronous.”
413	Fig. 8-21(B) caption should read “Satellite in 11,000 km circular orbit at 55 deg inclination”
421	1 <sup>st</sup> paragraph: line 2: “Eq. (9-6)” should read “Eq. (9-8)” line 6: “Eq. (9-7)” should read “Eq. (9-9)” and “Eq. (9-8)” should read “Eq. (9-10)” line 7: “Eq. (9-8)” should read “Eq. (9-7)” line 9: “Eq. (9-7)” should read “Eq. (9-6)” line 11: “e” should read “ε”
422	Eq. (9-10) should read $\Phi_E = a \cos 2 \left[ \frac{\cos Lat'_p - \cos Lat'_{SSP} \cos \lambda}{(\sin Lat'_{SSP} \sin \lambda)}, H(\Delta L) \right]$
423	In Eq. (9-11), last term should read “(1 - sin ρ cos λ)” not “(- sin ρ cos λ)”
423	Eq. (9-15) should read $\Delta L = a \cos \left[ \frac{\cos \lambda - \cos Lat'_p \cos Lat'_{SSP}}{H(Lat'_{SSP}) \sin Lat'_{SSP} \sin Lat'_p} \right] - 90 \text{ deg} [H(Lat'_{SSP}) - 1]$
438	In Eq. (9-49), last term numerator: “sin <sup>2</sup> (2λ)” should read “sin (2λ)”
438	In Eq. (9-50), numerator: “R <sub>E</sub> - (1 - f)” should read “R <sub>E</sub> (1 - f)”
441	Eq. (9-54) should read “T = (ψ <sub>0</sub> / 180) P”
442	Eq. (9-59) should read “tan Φ = tan β / sin ψ”
457	2 <sup>nd</sup> paragraph, 6 <sup>th</sup> line: “increases by 360 deg” should read “changes by 360 deg”
460	In Table 9-4 caption, 2 <sup>nd</sup> line: “H = 1,500 km” should read “H = 1,000 km”
460	In Table 9-4, “Rotating Earth” column: “Maximum angular rate” row: “Eq. No.” column should read “9-106” “Azimuth range” row: “Eq. No.” column should read “9-114” “Time in view” row, 1 <sup>st</sup> equation: “Eq. No.” should read “9-113a” “Time in view” row, 2 <sup>nd</sup> equation: “Eq. No.” should read “9-113b”
461	Eq. (9-114) should read $\cos(\Delta\phi / 2) = \frac{\cos \gamma \cos \lambda_{\max} - \cos \rho_s}{\sin \gamma \sin \lambda_{\max}}$
465	In Sec. 9.4.4, 1 <sup>st</sup> paragraph: line 4: “4-hour period.” should read “1-hour period.” line 11: “2-month period.” should read “10-day period.”
465	In Fig. 9-33: “4-Hour Period.” should read “1-Hour Period.”
467	1 <sup>st</sup> paragraph:

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	line 3: “Eq. (4-7)” should read “Eq. (4-12)” “Eq. (4-9)” should read “Eq. (4-14)” line 4: “Sec. 4.1.3” should read “Sec. 4.1.4” line 9: “Eq. (4-14)” should read “Eq. (4-17)” and “Sec. 4.1.3” should read “Sec. 4.1.4” line 13: both “Eq. (4-6)” references should read “Eq. (4-11)” and “Sec. 4.1.3” should read “Sec. 4.1.4”
468	In Table 9-6, 1 <sup>st</sup> equation, last term: “  L  ” should read “  $\phi$  ” In paragraph following this equation both references to “L” should read “ $\phi$ ”
468	In Table 9-6, middle: “(See Fig. 9-35.)” should read “(See Fig. 9-36.)”
476	In Fig. 9-40: “ $\phi$ ” should read “ $\Delta v$ ”
494	Figure 9-57 has been revised. See revised figure following the errata listing.
528	1 <sup>st</sup> line following Eq. (10-26): “u” should be “ $\mu$ ” in both equations.
540	In Eq. (10-57b), “ $\eta_2 = 180 \text{ deg} - \eta_1 - \lambda h$ ” should read “ $\eta_2 = 180 \text{ deg} - \eta_1 - \lambda$ ”
556	In Eq. (11-6): equation appears twice. Should read “ $F = \hat{N} \cdot \hat{S} = \cos \beta$ ”
560	In Fig. 11-10: lines to lower and higher satellites are drawn incorrectly. See revised figure following the errata listing.
562	In Fig. 11-13: the indices are incorrect. “P” should be “D”; “D” should be “R”; and “ $\rho_p$ ” should be “ $\rho_D$ ”. See revised figure following the errata listing.
566	In Eq. (11-30): line 2, 1 <sup>st</sup> term: “ $-\cos \rho_s$ ” should read : “ $-\cos \rho_p$ ” and remove “]” at end of equation line 3: insert “]” at end of equation
570	Last paragraph, 1 <sup>st</sup> line: “Fig. 11-25” should read “Fig. 11-22”
573	In Eq. (11-34), numerator: “+” should be a “-”
573	2 <sup>nd</sup> line after Eq. (11-35): “ $\theta$ ” should be “ $\theta'$ ”
574	In Eq. (11-34), numerator: “+” should be a “-”
574	Line after Eq. (11-41): “T” should read “S”
574	Eq. (11-43) should read $\cos \gamma = \frac{\cos \beta - \cos \lambda \cos \beta_T}{\sin \lambda \sin \beta_T}$
575	1 <sup>st</sup> paragraph, 4 <sup>th</sup> line: “s” should be “ $\sigma$ ”
575	2 <sup>nd</sup> line after Eq. (11-47): “s” should be “ $\sigma$ ”
575	In Eq. (11-48): “89.67” should read “89.73”
580	1 <sup>st</sup> paragraph, 2 <sup>nd</sup> line: “Table 11-3” should read “Table 11-4”
597	In Table 12-3, 2 <sup>nd</sup> column, “Spacecraft Disposal” row: “Eq. (2-84)” should read “Eq. (2-85)”
621	In Table 12-4: add Earth entry. The entries are: 6378.136; 8.616 410 04 $\times 10^4$ ; 2.959 310 20 $\times 10^{15}$ ; 42,164.173; 1.029 549 648 $\times 10^{14}$
636	In Fig. 12-18 caption: “(A)” should read “(B)” and “(B)” should read “(A)”
642	In Fig. 12-23, top left: “14.5 (90.9)” should read “14.5 (9.5)”
650	In Table 12-24, 1 <sup>st</sup> row, 2 <sup>nd</sup> column, 2 <sup>nd</sup> equation: “ $\sqrt{V_\infty^2 - V_{eP}^2}$ ” should read “ $\sqrt{V_4^2 - V_{eP}^2}$ ”
733	Eccentricity section, line 2: “frozen eccentricity” should read “frozen orbit”
738	6 <sup>th</sup> line following Eq. (14-4): “plus” should read “minus” and “minus” should read “plus”
758	1 <sup>st</sup> paragraph, line 12: “2 km” should read “5 km”
771	Eq. (A-6c) should read “ $\alpha_0 = \text{atan}(y_0 / x_0)$ ”
787	In Eq. (A-34a): “(180° - B <sub>1</sub> )” should read “(180° - b <sub>1</sub> )”
791	In Eq. (A-40a): “(cos $\phi$ , sin $\phi$ )” should read “(sin $\phi$ , cos $\phi$ )”

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791	In Eq. (A-41): line 2, last term: “ $x < 0$ ” should read : “ $x > 0$ ” line 3: “if $- x  \leq y \leq  x $ and $< 0$ ” should read “if $ y  \leq  x $ and $x < 0$ ” line 4: “ $-\text{atan}(y/x)$ ” should read “ $-\text{atan}(x/y)$ ” line 5: “ $-\text{atan}(y/x)$ ” should read “ $-\text{atan}(x/y)$ ” and “if $y <  x $ ” should read “if $y < - x $ ”
804	In Fig. B-3: angle labeling corrected. See corrected figure in page following listing.
805	In Eq. (B-15): “ $H(\Delta\phi_2)$ ” should read “ $H(\delta'_1)$ ” in both instances
836	In Eq. (D-7): “ $\hat{\mathbf{z}} \times \mathbf{h} / \mathbf{h}$ ” should read “ $\hat{\mathbf{z}} \times \mathbf{h} / h$ ”
836	Eq. (D-11) should read $q = a = r$
841	In Eq. (D-59), 1 <sup>st</sup> line: “ $E = \text{atan2}(\cos E, \sin E)$ ” should read “ $E = \text{atan2}(\sin E, \cos E)$ ”
841	In Eq. (D-60), 1 <sup>st</sup> line: “ $\nu = \text{atan2}(\cos \nu \sin \nu)$ ” should read “ $\nu = \text{atan2}(\sin \nu \cos \nu)$ ”
841	In Eq. (D-61), last term: “ $O(e^4)$ ” should read “ $\mathcal{O}(e^4)$ ”
846	In Eq. (D-97): “ $\hat{\mathbf{z}} \times \mathbf{h} / \mathbf{h}$ ” should read “ $\hat{\mathbf{z}} \times \mathbf{h} / h$ ”
848	In Eq. (D-97): “ $\hat{\mathbf{z}} \times \mathbf{h} / \mathbf{h}$ ” should read “ $\hat{\mathbf{z}} \times \mathbf{h} / h$ ”
848	Eq. (D-132) should read $\psi = 2 \operatorname{asin}\left(\frac{1}{e}\right) = 2 \operatorname{asin}\left(\frac{1}{1 + V_\infty^2 q / \mu}\right) = 2 \operatorname{atan}\left(\frac{a}{b}\right)$ $= 2 \operatorname{atan}\left(\frac{\mu}{V_p V_\infty r_p}\right) = 2 \operatorname{atan}\left(\frac{\mu}{\rho V \sqrt{\eta} \cos \phi_{jpa}}\right)$
849	Eq. (D-141), 1 <sup>st</sup> line: “ $\text{atan2}(\cos V, \sin V)$ ” should read “ $\text{atan2}(\sin V, \cos V)$ ”
Explanation of Earth Parameters	# 41: A right parenthesis is missing at end of equation and reference to “col. 62” should read “col. 57” # 49: Reference to “col. 42” should read “col. 41” #: 1 <sup>st</sup> exponent should not be negative