Supplement

to

Studies in Radar Cross-Sections

I - XV

Errata and Addenda

Compiled by

J. W. Crispin

1 September 1955

WR-27-S

The University of Michigan
Engineering Research Institute
Willow Run Laboratories
Willow Run Airport
Ypsilanti, Michigan

TABLE OF CONTENTS

I. INTRODUCTION

   This supplement contains all the errata and addenda to the first fif-
teen papers in the series "Studies in Radar Cross-Sections" as of 1
September 1955. Inasmuch as several of the papers in the series have
been reprinted and some of the corrections listed have been made in the
reprinted versions, errata are listed separately for each printing.

   The material of this supplement is arranged so that the errata and
addenda for each paper can be removed from the supplement and attached
to the paper itself.

   Much of the unclassified material contained in these reports has also
been published in Journal articles and thus the errata and addenda for
these related Journal articles is included.

II.   STUDIES IN RADAR CROSS-SECTIONS I - XV:

Errata & Addenda

Studies in Radar Cross-Sections - I: Scattering By A Prolate Spheroid
by F. V. Schultz   (UMM-42, March 1950; Reprinted November 1953).
Contract No. W 038-ac-14222.   UNCLASSIFIED.

Errata in First Printing

Pg. 27-29 & Appendix B	$d_n^{m\ell} = 0$ whenever $(\ell + n)$ is odd
Pg. 37, Eq. 120	Delete the underline from ${}^s T_z$
Pg. 39, Eq. 135 & Eq. 136	Delete the factor $\dfrac{\sqrt{k^2 r^2 - 1}}{kr}$
Pg. 42, Eq. 146	The factor $(n-4)!$ in the fifth term on the right should be replaced by $(m-4)!$
Pg. 46, 5th line above table at bottom of page	Delete the (σ_0)
Pg. 46	Add the following footnote: Some of the numerical values appearing on this page are in error. These numbers will be corrected and additional numerical work on the problem will be presented in a forthcoming report, UMM-126.
Pg. 50, Eq. A-12	The Eq. should read $${}^s \psi = T \dfrac{I_{\psi_o} a_o}{r} e^{-jkr}$$

Pg. 50, Eq. A-13   The Eq. should read

$$T = \frac{1}{c\xi_o} \sum_{l=0}^{\infty} (j)^{l+1} A_{ol} \frac{\left[\frac{d}{d\xi} R_{ol}^{(1)}(\xi)\right]_{\xi=\xi_o}}{\left[\frac{d}{d\xi} R_{ol}^{(4)}(\xi)\right]_{\xi=\xi_o}} S_{ol}^{(1)}(\eta)$$

Errata in Second Printing

None

Addenda

None

<u>Studies in Radar Cross-Sections - II: The Zeros of the Associated Legendre Functions</u> $P_n^m(\mu')$ <u>of Non-Integral Degree</u> by K. M. Siegel, D. M. Brown, H. E. Hunter, H. A. Alperin, and C. W. Quillen (UMM-82, April 1951; Reprinted November 1953). Contract No. W 038-ac-14222. UNCLASSIFIED.

<u>Errata in First Printing</u>

None

<u>Errata in Second Printing</u>

None

<u>Addenda</u>

None

Studies in Radar Cross-Sections - III: Scattering by a Cone by K. M. Siegel and H. A. Alperin (UMM-87, January 1952; Reprinted November 1953). Contract No. AF 30(602)-9. UNCLASSIFIED.

Errata in First Printing

Pg. 6	Delete the second sentence of the footnote
Pg. 14, 3rd line from bottom of page	Replace $\lim\limits_{\rho \to \infty} (- - - -) = w$ by $\lim\limits_{\rho \to \infty} (- - - -) = W$
Pg. 34, line above Eq. A-6	Replace . . . . is not an integer. by . . . . is not a non-zero integer.
Pg. 35, Eq. A-7	A factor of 4 is missing; the Eq. should read $$u = 4 \left(\frac{\pi}{2kr}\right)^{1/2} \sum_i{}'$$
Pg. 38, line 2	Add an asterisk (*) denoting footnote after the word "non-integral"
Pg. 38, Eq. in line 6	Replace $(\theta_0 < \theta \leq 0)$ by $(\theta_0 \geq \theta > 0)$
Pg. 38	Add the following footnote: With the exception of $n_i = 0$. In the vector case, the term for $n_i = 0$ vanishes, but in the scalar case this term must be taken into account.

Errata in Second Printing

Pg. 14, 3rd line from bottom
of page   Same as in 1st printing

Pg. 38, Eq. in line 6   Same as in 1st printing

Addendum

Necessity of Considering Both Tip and Base Contributions for the Shallow Large-Angle Cone

The physical optics monostatic radar cross-section for the finite cone is given by
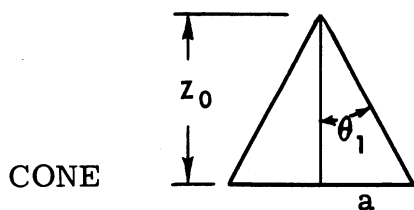
$$\sigma = \frac{4\pi}{\lambda^2} \left| g \right|^2 ,$$

where

$$g = \frac{2\pi \tan^2\theta_1}{(2jk)^2} \left[-2jk\, z_o e^{-2jkz_o} - e^{-2jkz_o} + 1 \right]$$

For large values of kz_o, σ is dominated by scattering from the base which contributes

$$\sigma = \pi z_o^2 \tan^4 \theta_1 .$$

(The quantities z_o and θ_1 are defined in the following sketch.)

CONE

As θ_1 approaches $\pi/2$, and $z_o \to 0$, this expression appears to become infinite, while the cone cross-section should actually become that of the circular disc in this limit. When both the tip and the base contributions are considered, however, the cross-section remains finite and approaches that for a circular disc of radius a.

Consider the limit as $z_o \to 0$ and a remains fixed:

$$g \to \frac{2\pi a^2}{(2jk)^2 z_o^2} \left[- 2jkz_o (1-2jkz_o)-1+2jkz_o - \frac{(2jkz_o)^2}{2} + 1 \right],$$

or

$$g \to \frac{2\pi a^2}{(2jk)^2 z_o^2} \; (-2k^2 z_o^2) = \pi a^2,$$

the area of the corresponding circular disc, as is proper.

In investigating the region of validity for the base scattering formula given above, it is immediately obvious that the customary assumption, that base scattering alone is important for $k z_o > > 1$, is correct. For then, any increase to infinity of σ can be obtained only by making the base of the cone infinite. The cone then approaches an infinite flat plate. In this case both the complete expression for σ and the base scattering expression blow up as a^4, but the base contribution is a good approximation to the complete one.

For small kz_o, the region in which the base contribution becomes infinite while the total σ does not, the base scattering cross-section should not be used to approximate the total σ.

The condition that the base contribution be a good approximation is

$$\left| -2jkz_o e^{-2jkz_o} \right|^2 \; \approxeq \; \left| -2jkz_o e^{-2jkz_o} -e^{-2jkz_o} + 1 \right|^2$$

or

$$1 + \left(\frac{\sin(x/2)}{x/2}\right)^2 - 2 \cdot \left(\frac{\sin x}{x}\right) \cong 1$$

where $x = 2kz_o$.

A computation based on the above condition yields the result that for

$x > 20$, or $kz_o > 10$, the relative error $\left|\dfrac{\sigma_{total} - \sigma_{base}}{\sigma_{base}}\right|$ is less than 10%.

This computation is an indication of the range for which the complete expression may be replaced by that for the base contribution alone.

Studies in Radar Cross-Sections - IV: Comparison Between Theory and Experiment of the Cross-Section of a Cone by K. M. Siegel, H. A. Alperin, J. W. Crispin, H. E. Hunter, R. E. Kleinman, W. C. Orthwein, and C. E. Schensted (UMM-92, February 1953; Reprinted April 1955). Contract No. AF 30(602)-9. UNCLASSIFIED.

Errata in First Printing

Pg. 13, 3rd line of Eq. IV-5

Divide the first factor of this term by

$$1 - \exp\left[\frac{-\pi^2 j}{2(\pi - \theta_2)} \right]$$

Pg. 39. in Fig. VI-1

The "experimental point" plotted at $\theta_1 = 70^{\circ}$ should be at $\theta_1 = 65^{\circ}$

Errata in Second Printing

Pg. 39, in Fig. VI-1

Same as in first printing

Addenda

None

Studies in Radar Cross-Sections - V: An Examination of Bistatic Early Warning Radars by K. M. Siegel (UMM-98, August 1952). Contract No. W 33-038-ac-14222. SECRET.

Errata

Pg. 1, Eq. 1	Replace R = ...
	by R_{max} = ...

Pg. 6, Fig. 3 — The value of 2 shown on the ordinate scale is misplaced; it should be located at the heavy ordinate line directly below. Since the ordinate scale is logarithmic, reference to the rest of the ordinate scale indicates the proper location of the misplaced 2.

Pg. 13, in legend of Fig. 6 — The 2nd line of the legend should read .... of Focal Length $F/\sqrt{2}$.

Addenda

For additional comments relative to the finite cone see the Addenda for Studies in Radar Cross-Sections III.

Studies in Radar Cross-Sections - VI: Cross-Sections of Corner Reflectors and Other Multiple Scatterers at Microwave Frequencies by R. R. Bonkowski, C. R. Lubitz, and C. E. Schensted (UMM-106, October 1953; Reprinted June 1954). Contract No. AF 30(602)-9. SECRET (UNCLASSIFIED when Appendix is removed).

Errata in First Printing

Pg. 11, Eq. 2.4-3   Replace $\hat{k} + 2(\hat{k}$ ....

by $\hat{k} - 2(\hat{k}$ ....

Pg. 16,   Caption on the horizontal scale should be γ DEGREES

Pg. 39, Eq. 3.4-6   The last term should be

$$(z + b_1)^2 \, d\phi^2$$

Pg. 41, line below Eq. 3.4-16   Replace "For $\phi = \theta$ ....

by   "For $\phi = 0$ ....

Errata in Second Printing

Pg. 39, Eq. 3.4-6   Same as in 1st printing

Pg. 41, line below Eq. 3.4-16   Same as in 1st printing

Addenda

None

Studies in Radar Cross-Sections - VII: Summary of Radar Cross-Section Studies Under Project Wizard by K. M. Siegel, J. W. Crispin, and R. E. Kleinman (UMM-108, November 1952). Contract No. W 33-038-ac-14222. SECRET.

   This paper is replaced by Studies in Radar Cross-Sections XII; all of the data appearing in this paper appear   in Studies XII together with much additional data. For additional comments relative to the finite cone see the addenda to Studies in Radar Cross-Sections III.

Studies in Radar Cross-Sections - VIII: Theoretical Cross-Sections as a Function of Separation Angle Between Transmitter and Receiver at Small Wavelengths by K. M. Siegel, H. A. Alperin, R. R. Bonkowski, J. W. Crispin, A. L. Maffett, C. E. Schensted, and I. V. Schensted. (UMM-115, October 1953; Reprinted June 1954). Contract No. W33-038-ac-14222. UNCLASSIFIED.

Errata in First Printing

Pg. 4, Fig. 2[1]

The physical optics curve in the region $.08 < (R_o/\lambda) < .3$ is in error. The correct curve should pass through the following points:

R_o/λ	.08	.16	.24
$\sigma/\pi R_o^2$	0.24	0.80	1.35

Pg. 11, Eq. 3.2-4   Replace $\vec{F}(\beta)$ by $\vec{F}$

Pg. 12, Eq. in line 2   "

Pg. 12, Eq. 3.2-5   Replace $\sigma(\beta)$ by σ

Pg. 12, Eq. 3.2-6   Replace $\sigma_e(\beta)$ by σ_e

Pg. 12, 2nd line below Eq. 3.2-6   "

Pg. 12, 3rd line below Eq. 3.2-6   Replace $\sigma(\beta)$ by σ

Pg. 21, Eq. 4.1-1   The Eq. should read
.... $-b\eta$ }]d ϕ d η .

Pg. 28, Eq. 4.3-8   The following restriction on α should appear with the Eq. :

$$\sqrt{1/b} < \alpha < (\pi/2) - \sqrt{1/b}$$

---

[1]The vector solution which appears on the figure is intended to be a reproduction of the theoretical sphere curve which appears in "Propagation of Short Radio Waves" by D. E. Kerr. Due to plotting errors the curve appearing on this figure is slightly in error. Reference to Kerr's book will indicate the location and magnitude of the errors.

Pg. 50, Eq. 6.1-4

An exponent of 3/2 is missing; the denominator should be

$$\pi D^2 \left[(Aa)^2 + (Bb)^2 \right]^{3/2}$$

Pg. 51, line above Eq.

Replace $\phi_t = \phi_r = 0$ ....

by $\phi_t = \phi_r = \phi$ ....

Pg. 51, Eq. 6.1-5

Replace $\sigma(\theta) = $ ....

by $\sigma(\theta, \phi) = $ ....

Pg. 57

In the caption for the horizontal scale: Replace $\beta_1 + \beta$
by $\beta_1 + \beta/2$
In the legend attached to the curve itself: Replace $\beta \, \beta/2$
by $\beta_1 - \beta/2$

Errata in Second Printing

Pg. 4, Fig. 2

Same as in 1st Printing

Pg's. 11 & 12

Same as in 1st Printing

Pg. 28

Same as in 1st Printing

Pg. 57

Same as in 1st Printing

Addenda

(1) For additional comments relative to the finite cone see the addenda for Studies in Radar Cross-Sections III.

(2) The Nose-On Cross-Section of an Ogive of Half-Angle α

Since an ogive of half-angle α obtained by rotating an arc of a circle

of radius R about its chord becomes a sphere of radius R when α is set equal to $\pi/2$, the nose-on cross-section of an ogive should approach the cross-section of a sphere as $\alpha \rightarrow \pi/2$. The nose-on cross-section formula for an ogive, given in Studies in Radar Cross-Sections VIII, does not, at first glance, seem to have this property.

The physical optics method employed in Studies VIII to obtain these cross-section formulas involves the assumption, among others, that the wavelength is small with respect to the characteristic dimension of the scatterer. Thus the formulas are only expected to hold for those scatterers for which $\lambda/4\pi R$ is small.

With this in mind, let us examine more closely the nose-on cross-section formula for the ogive, $\sigma(\alpha)$, given in Studies VIII (Eq. 4.3-7)

$$\sigma(\alpha) = \frac{\lambda^2 \tan^4 \alpha}{16 \pi} \text{ with } (\lambda/4\pi R)^{1/2} < \alpha < (\pi/2)-(\lambda/4\pi R)^{1/2} \quad ,$$

and its relation to the geometric optics cross-section for a sphere, πR^2. To do this consider

$$\frac{\sigma(\alpha)}{\pi R^2} = \left[\sqrt{\lambda/4\pi R} \ \tan \alpha \right]^4$$

The range (in α) of the validity of the cross-section formula for the ogive given above indicates that,

$$\frac{\sigma(\alpha)}{\pi R^2} < \left[\sqrt{\frac{\lambda}{4\pi R}} \ \tan \left(\frac{\pi}{2} - \sqrt{\lambda/4\pi R} \right) \right]^4$$

i.e.,

$$\frac{\sigma(\alpha)}{\pi R^2} < \left[\sqrt{\frac{\lambda}{4\pi R}} \ \cot \sqrt{(\lambda/4\pi R)} \right]^4 .$$

Since the function (x cot x) is always less than one for small positive x, and since the limit of (x cot x) is one as x approaches zero, it follows that for a fixed $\lambda/4\pi R$ the nose-on cross-section of an ogive as defined in Studies VIII never exceeds the geometric optics sphere answer of πR^2. In fact, keeping in mind the range of validity for $\sigma(\alpha)$ for the ogive, it thus appears as though the ogive answer "approaches" the sphere answer as α approaches $\pi/2$ <u>if $\lambda/4\pi R$ is small.</u> This is illustrated in the following figure.

By examination of Equation 4.1-3, which applies for the sphere and Equation 4.3-5, for the ogive (see pg. 21 & 27 of Studies VIII), it is readily seen that if α is set equal to $\pi/2$ in the "ogive - integral" one obtains the "sphere - integral"[1]. The sphere integral can be evaluated exactly while, with $\alpha < \pi/2$, the ogive integral must be approximated.

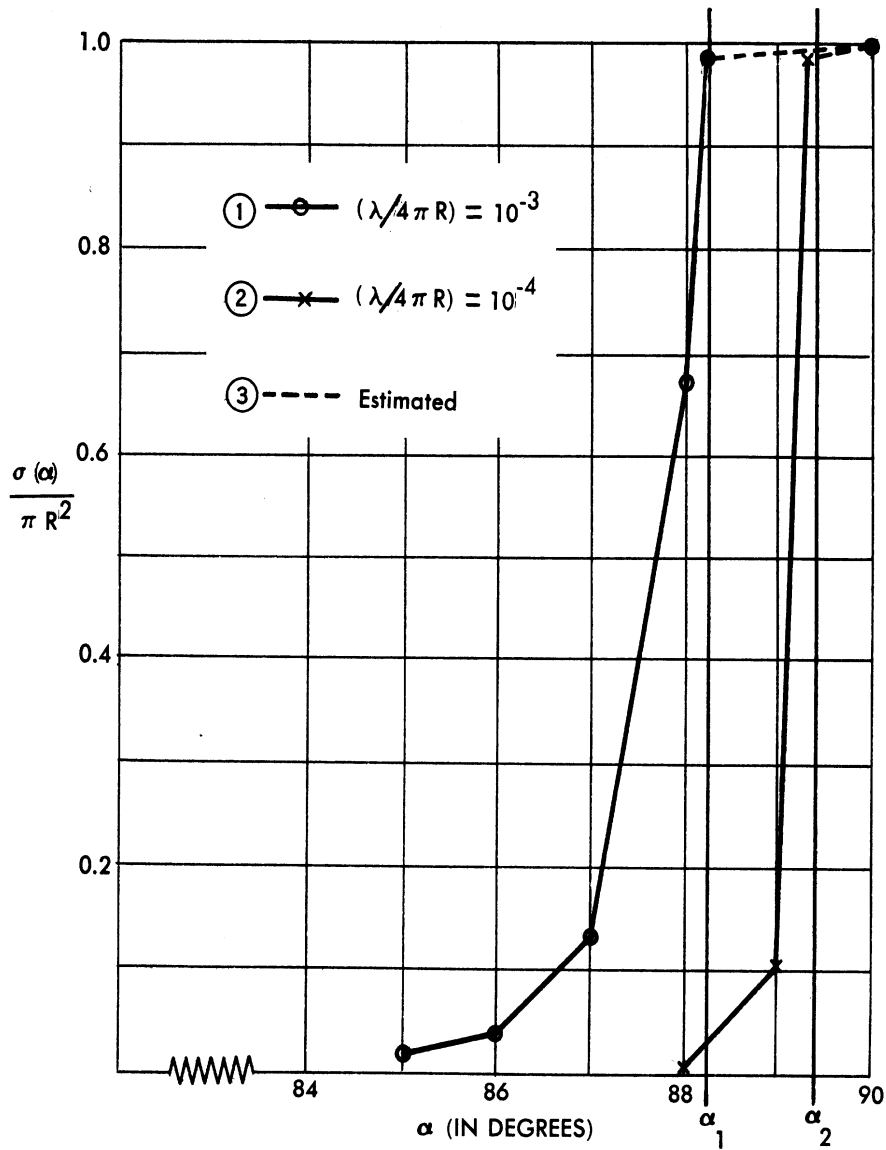[1]This explains the plotted points at $\alpha = \pi/2$ on the figure.
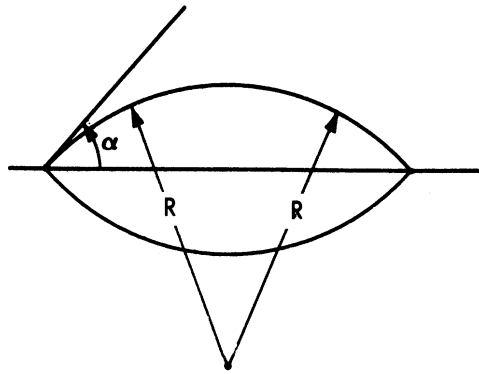
$$\alpha_1 = (\pi/2) - (\lambda/4\pi R)^{1/2}$$

$$\text{for } (\lambda/4\pi R) = 10^{-3}$$

$$\alpha_2 = (\pi/2) - (\lambda/4\pi R)^{1/2}$$

$$\text{for } (\lambda/4\pi R) = 10^{-4}$$

THE NOSE-ON CROSS-SECTION, $\sigma(\alpha)$, OF AN OGIVE WITH LARGE HALF-ANGLE

Studies in Radar Cross-Sections - IX: Electromagnetic Scattering By An Oblate Spheroid by L. M. Rauch (UMM-116, October 1953). Contract No. AF 30(602)-9. UNCLASSIFIED.

Errata

None

Addenda

None

Studies in Radar Cross-Sections - X: The Radar Cross-Section of a Sphere by H. Weil, (to be published).

Studies in Radar Cross-Sections - XI: The Numerical Determination of the Radar Cross-Section of a Prolate Spheroid by K. M. Siegel, B. H. Gere, I. Marx, and F. B. Sleator (UMM-126, December 1953). Contract No. AF 30(602)-9. UNCLASSIFIED.

Errata

Pg. 13, 4th line from bottom of page

Replace ....page 79....

by ....page 59....

Pg. 19, Eq. (II-5) & (II-6)

Insert brackets:

$$\frac{d}{d\xi}\left[(\xi^2-1)\,\frac{dU_{mn}}{d\xi}\right] - \left[-\ -\ - \right.$$

$$\frac{d}{d\eta}\left[(1-\eta^2)\,\frac{dV_{mn}}{d\eta}\right] - \left[-\ -\ - \right.$$

Pg. 20, Eq. II-12

Replace $\ldots + \left[\dfrac{m^2}{1-\zeta^2} - \ldots \right.$

by $\ldots + \left[\dfrac{-m^2}{1-\zeta^2} - \ldots \right.$

Pg. 36, Eq. IV-8

Replace $\sigma = \ldots$

by $\sigma' = \ldots$

Pg. 37, Eq. IV-10

$H_n(\xi_o)$ should be replaced by $H_n^*(\xi_o)$ in second series only.

Pg. 42, Eq. V-14

Replace $-8c^{m-1}\,\Gamma\,(\ldots$

by $-8c^{m-2}\,\Gamma\,(\ldots$

Pg. 43, Eq. V-20

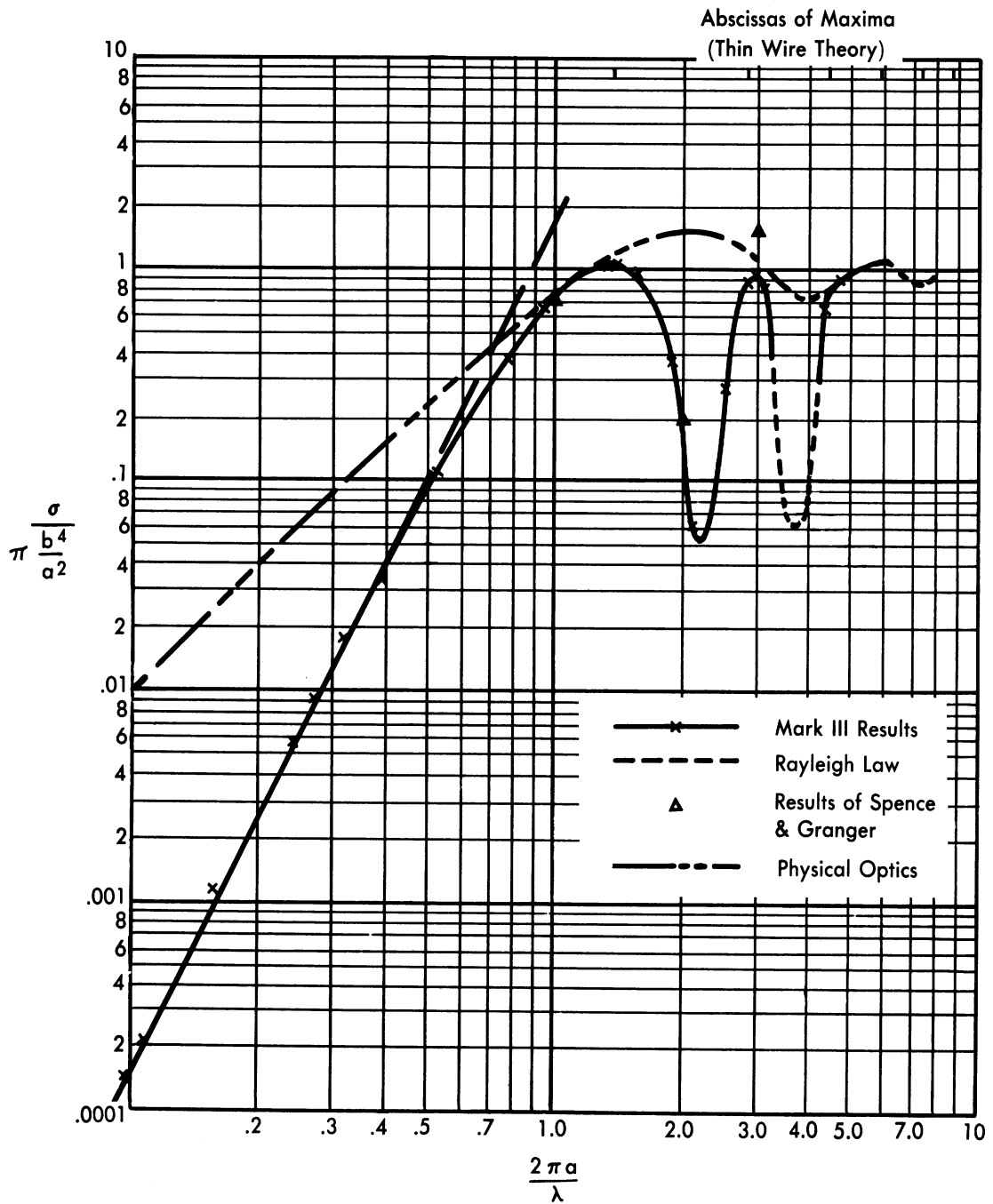Replace $P_{-n-1}(\xi)$ and $Q_n(\xi)$

by $P_{-k-1}(\xi)$ and $Q_k(\xi)$

Pg. 54, 2nd line below Eqs.

Replace Ref. 26 by Ref. 30.

Pg. 55, 7th line from bottom of page	Replace Reference 28 by Reference 15.
Pg. 65, in I_1^{Nn}	Replace $S_{on}^{(1)}(\eta) \quad S_{on}^{(1)}(\eta)$ by $S_{oN}^{(1)}(\eta) \quad S_{on}^{(1)}(\eta)$
Pg. 65, in I_2^{Nn}	Replace $S_{on}^{(1)}(\eta)$ by $S_{oN}^{(1)}(\eta)$
Pg. 69, Eq. in middle of page (also in 1st line under Equation)	Replace $P_{n+k}^{m}(\cos\theta)$ by $P_{m+k}^{m}(\cos\theta)$
Pg. 69, last Eq. (at bottom of page)	Replace right hand side by 0.
Pg. 74, add Ref. 30	R.D.Spence and S.Granger, "Scattering of Sound from a Prolate Spheroid", Journal Acoust. Soc. of America, Vol. 23, No. 6, p. 701 (1951).

Addendum
───────

Recent computations on the scalar cross-section of the prolate spheroid (nose-on back-scattering) indicate that the broken portion of the scalar curve shown in UMM-126 is misleading. The available values indicate that the second and third maxima, instead of becoming successively larger, actually decrease slightly from the ordinate of the first. Ordinates of both second and third maxima are slightly greater than 1.0 and less than the ordinate of the first, and that of the third is less than that of the second. Abscissas of both are approximately the same as those shown in UMM-126. No accurate values are yet available for the regions of the minima, but it appears likely that the first minimum shown is nearly correct and that the ordinate of the second should be slightly greater than that of the first. The results of these recent computations are shown in the following figure.

Abscissas of Maxima
(Thin Wire Theory)

$$\pi \frac{\sigma}{\frac{b^4}{a^2}}$$

	Mark III Results
- - - - -	Rayleigh Law
▲	Results of Spence & Granger
—·—·—	Physical Optics

$$\frac{2\pi a}{\lambda}$$

ACOUSTICAL BACK-SCATTERING FROM A PROLATE SPHEROID (a/b=10)

Studies in Radar Cross-Sections - XII: Summary of Radar Cross-Section Studies Under Project MIRO, by K. M. Siegel, M. E. Anderson, R. R. Bonkowski, and W. C. Orthwein (UMM-127, December 1953). Contract No. AF 30(602)-9. SECRET.

Errata

Pg. 47, 1st col., 6th row   Replace 4" sq. 1/8" thick)
                                   by 4" sq., 0.8" thick)

Pg. 53, Ref. A.10   Replace 308-23 by 302-23

Pg. 89, 4th col., 2nd row   Replace .12 by .02

Addenda

None

Studies in Radar Cross-Sections - XIII: Description of a Dynamic Measurement Program by K. M. Siegel and J. M. Wolf (UMM-128, July 1954). Contract No. W33-038-ac-14222. CONFIDENTIAL.

Errata

Pg. 60, line below exp $\left[-E/kT\right]$ E is the magnitude of the electric vector, should be replaced by:
E is the ionization potential of the atoms or molecules making up the smoke (measured in units of energy),

Pg. 143, 4th line $\left[1 - (\hat{A} \cdot \hat{B})\right]^2$ should be replaced by $[1 - (\hat{A} \cdot \hat{B})^2]$

Addenda

None

Studies in Radar Cross-Sections - XIV: Radar Cross-Section of a
Ballistic Missile by K. M. Siegel, M. L. Barasch, J. W. Crispin,
I. V. Schensted, W. C. Orthwein, and H. Weil (UMM-134, September
1954). Contract No. W 33(038)-ac-14222. SECRET.

Errata

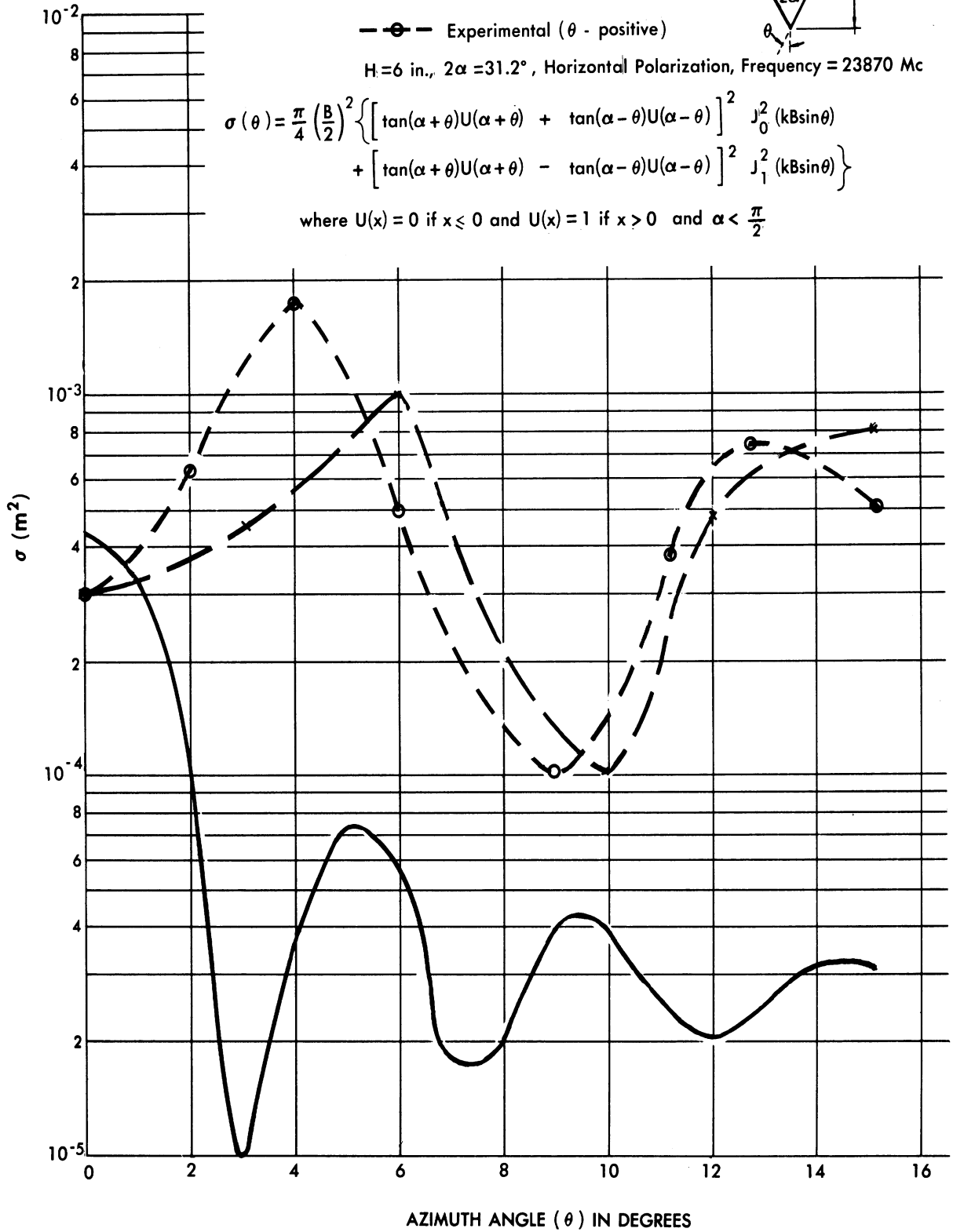|	
Opposite Page i	Report 2260-1-T should be Studies in Radar Cross-Sections XV, not XIV; and the authors are C. E. Schensted, J. W. Crispin, and K. M. Siegel.
ii, 3rd line of (1) under Intermediate objectives	the words...vector wave equation should be replaced by...theory.
Pg. 12, last line	Replace...minute...by...half-minute...
Pg. 14, 1st line	Replace...are...by...is..
Pg. 35, Fig. 5.2-16	The horizontal scale of the graph should read from $0°$ to $100°$ instead of from $0°$ to $10°$ as shown.[1]
Pg. 42, legend of Fig. 5.3-3	Replace...Envelopes...by... Limits...
Pg. 46, 1st line of footnote	Replace...at...by...by...
Pg. 133, legend of Fig. 6-13	Replace...Means...by...Mean Replace...S-band...by...L-band..
Pg. 147	The theoretical curve and the formula for it which appear in Fig. 7.1-2 are in error; see the following figure for the appropriate changes.
Pg. 148, 4th line from bottom	Replace $k_2 \ll k_1$.) by k_1 were too large.).
Pg. 149, Title of Fig. 7.1-3	Insert a double asterisk at end of title and add this footnote:[**] K_3 is independent of λ.

---

[1]This is also the case in Fig. 5.2-18 on page 37.
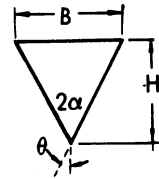
—————— Theoretical

— ✕ — Experimental (θ - negative)

— ⊖ — Experimental (θ - positive)

H =6 in., 2α =31.2°, Horizontal Polarization, Frequency = 23870 Mc

$$\sigma(\theta) = \frac{\pi}{4}\left(\frac{B}{2}\right)^2 \left\{ \left[\tan(\alpha+\theta)U(\alpha+\theta) + \tan(\alpha-\theta)U(\alpha-\theta) \right]^2 J_0^2(kB\sin\theta) \right.$$

$$\left. + \left[\tan(\alpha+\theta)U(\alpha+\theta) - \tan(\alpha-\theta)U(\alpha-\theta) \right]^2 J_1^2(kB\sin\theta) \right\}$$

where $U(x) = 0$ if $x \leqslant 0$ and $U(x) = 1$ if $x > 0$ and $\alpha < \frac{\pi}{2}$

$\sigma\ (m^2)$

AZIMUTH ANGLE (θ) IN DEGREES

CROSS-SECTION OF A FINITE CONE FOR OFF-NOSE ASPECTS

Pg. 159, 1st line of definition of g_1 — Replace...$\tan(\alpha+\theta)e\sqrt{\ell_o}$...by... $\tan(\alpha+\theta)\sqrt{\ell_o}e$...

Pg. 176, in the figure — The limits on the integral should be z's instead of Z's

Pg. 176, 2nd Eq. below figure — All z's in the integral should be primed

Pg. 176, 3rd line from bottom — Replace...$\exp[(4\pi iR\sin\theta'/\pi)-1]$ by... $[\exp(4\pi iR\sin\theta'/\lambda)-1]$

Pg. 176, 2nd line from bottom — Replace...$e^{i2kR\sin\theta'}$...by... $e^{i2kz'}$...

Pg. 176, last line — Replace $= \emptyset$ by $= \cos\emptyset$; Replace z by z'

Pg. 177, first line — Replace $2R^2\sin\theta'$ by $2R^2\sin^2\theta'$

Pg. 177, 4th line — $[$ is incomplete in front of J_1.

Pg. 178, Figure legend — Replace...$2R\tan(\pi-\theta)$ by... $2R\tan(\pi-\theta')$...

Pg. 179, 1st Eq. — All the θ' should be θ'' and the λ should be λ^2.

Pg. 195, 2nd paragraph — Add the following sentence to the end of the second paragraph. (Similarly, the possibility of two or more successive ionizing collisions by the same particle may be neglected.)

Pg. 196, Below Eq. (A.1-2) — The quantities are in MKS units.

Pg. 202, line above (A.1-10) — Replace $\theta_2|<y$ by $|\theta_2|<y$.

Pg. 204, 2nd line of Sect. A.1.2.1 — Delete the word...and...

Pg. 212, 7th line — Replace...impossible...by... unreasonable...

Pg. 214, footnote	Replace...appendix...by...section...
Pg. 226, second paragraph	Replace...this appendix...by... Section 5.3...
Pg. 246, 2nd line from bottom	The element ds has been omitted from the integral.
Pg. 257, 6th line	The word plan should be plane.
Pg. 263, Ref. 18	Replace...Exhaust Stream of the Jet...by...Exhaust Stream of Jet...
Pg. 263, Ref. 13	Replace the name Wilhams by Williams.

Addenda

None

Studies in Radar Cross-Sections - XV: Radar Cross-Sections of B-47 and B-52 Aircraft by C.E. Schensted, J.W. Crispin, and K.M. Siegel (2260-1-T, August 1954). Contract No. AF 33-(616)-2531. CONFIDENTIAL.

Errata

Pg. 12, Fig. 2.3-1	The peak for vertical polarization at $\gamma = 150^{\circ}$ should be approximately $1.5 \ m^2$
Pg. 73, 3rd line of Eq. from bottom of page	a $\bar{\sigma}_e^2$ term should be added to the right hand member
Pg. 79, 2nd line below Eq.	Replace $\rho = a$ by $\rho = -a$
Pg. 101, Eq. in 3rd line of Section A.2.4	Eq. can be simplified to read $$z = z_0 = \frac{(b - a)\sin \alpha}{1 - \cos \alpha}$$
Pg. 103, 2nd line under Eq. A.2-19	Replace $\hat{\phi}_1 \sin \hat{\phi}_1$ by $\hat{\phi}_1 \sin \phi_1$
Pg. 109, after Eq. in 3rd line below figure	add the phrase - where the principal value of the arctangent is used
Pg. 117, 2nd line above Eq. A.3-7	Replace...Equations (A.3-1) and... by...Equations (A.3-4) and...
Pg. 119, line above Eq. A.3-15	Replace...can replace Equation... by...can replace terms in Equation...
Pg. 119, Eq. A.3-16	Replace $\eta 2$ by η^2
Pg. 119, in (A.3-17)	Replace $8\pi_\eta$ by $8\pi\eta$
Pg. 124, in (A.3-34)	A factor of $\cos^2 \theta$ is missing
Pg. 133, Eq. A.3-51	The right hand member of the equation should be multiplied by the factor $$\left[3 \tan^{-1}(1/3) \right]^2$$

Pg. 136, "elliptical" part of Eq. A.3-54

The right hand member of the equation should be multiplied by the factor $\left[3 \tan^{-1} (1/3) \right]^2$

Pg. 153, Copy 89

This address should read:
Dr. A.D. Wheelon, Ramo-....

Addenda

None. For additional comments on the tapered wedge the reader is referred to Studies in Radar Cross-Sections XVII.

III - JOURNAL ARTICLES

Errata & Addenda

"The Zeros of $P_{n_i}^1(x_0)$ of Non-Integral Degree" by K. M. Siegel, J. W. Crispin, R. E. Kleinman, and H. E. Hunter, Journal of Mathematics and Physics, Vol. XXXI, No. 3, 170-179 (October 1952).

(1) Throughout this article the superscript 1 on the Legendre functions appears as a prime. That is, $P_{n_i}^1(x)$ should read $P_{n_i}^1(x)$ throughout the article.

(2) On page 172 in the line directly above Equation (2.4) the quantity $\frac{1}{2}(1-x_0)$ should read $\sqrt{\frac{1}{2}(1-x_0)}$.

"Electromagnetic and Acoustic Scattering by a Semi-Infinite Body of Revolution" by C. E. Schensted, Journal of Applied Physics, Vol 26, No. 3, 306-308 (March 1955).

(1) The two equations which appear in the second footnote of the left column on page 308 are not clear. They may be made clear by the appropriate insertion of grouping symbols and should read as follows:

and

$$\left[f^{(1)}/\rho\right]\left[\left\{f^{(1)} - \rho f^{(2)}\right\}\Big/\left\{(f^{(1)})^2 + 1\right\}\right] = 0$$

$$\left[f^{(1)} + \rho f^{(2)}\right]\Big/\rho = 0 .$$

"Bounds of the Legendre Function" by K. M. Siegel, Journal of Mathematics and Physics, Vol. XXXIV, No. 1, 43-49 (April 1955).

(1) Page 46, Equation (26) - the left hand member should read

$$P_{2i}(0) =$$

(i. e., the 2 is part of the subscript).

(2) Page 48, Equation (35) - the first factor in the second term of the left hand member should read

$$Q_{n_i}(x)$$

(i. e., the n_i is a subscript).