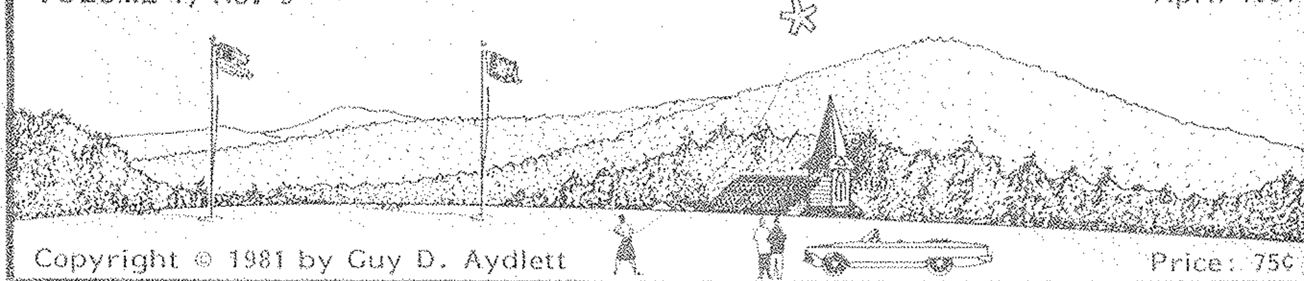
PINEY MOUNTAIN AIR FORCE

DATA ◎ LETTER

VOLUME 1, No. 5 April 1981



 Price: 75¢

Dear Kiteflier:

THE KITE LADY OF SAN ANTONIO, TX, Pat Hammond, charmed her Richmond Virginia audience on the evening of 6 March with her spirited slide-lecture: "The Kite: More Than Meets the Sky." We were also impressed by her array of kites that is on display in the Science Museum of Virginia from 3 March through 5 April 1981.

Pat's philosophy for successful kiteflying —her own aerodynamic theory—is: "Name them; they fly better." The names she uses are as impressive as her kite collection. She joggled our livers with "pun"ishments such as: *Soar Grapes*, *Flyin' the Ointment* [a silver Mylar® tube-replica with yellow screw-cap], *Of Corset Flies* [guess what?], *Swine Flew* [ugh!], and *THE BOOK OF COMMON AIR, Together with KITECHISM* [!].

Pat is an AKA Life Member, a Lifetime Subscriber to Valerie Govig's excellent *KITE LINES*, and our first official out-of-town subscriber to PMAF DATA-LETTER. Is Pat the most strung-out lady in Texas? Ask her family. . . . Her show is well worth seeing whenever or wherever it is offered. When you see Pat, tell her PMAF sent you.

NEWSLETTERS worthy of being sought by the serious kiteflier are coming to our attention. Consider these:

Leland Toy's *KITE FLYER* comes to us from the San Francisco Bay Area. Leland and Paul Walker commenced publication in July of 1978. The bi-monthly letter is now up to Volume 4, No. 2; a venerable age for kiteletters. Send $5.00 to *KITE FLYER*, 861 Clara Drive, Palo Alto, CA 94303, for a one-year subscription. Each issue we have seen is worth more than its asking price; each contained news, friendly editorial discourse, and one or more kite plans.

Leonard Conover's *TIGHT LINES* is the New Boy on the Block: It's off to a good start that coincides with the launching of a new kite club that is called THE GREATER DELAWARE VALLEY KITE SOCIETY. We venture to guess that you'd be considered a charter subscriber to Leonard's *Magnum Opus* if you send a $5.00 membership fee to: The Greater Delaware Valley Kite Society, 202 Pearl Street, Newfield, NJ 08344. [Leonard offers some interesting counsel to those folk whose assistance he solicits.]

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ARCHER M. NICKERSON Jr., of Duxbury Massachusetts, wants to know if the 40-foot bridles for the three Hornbeam kites mentioned in Volume 1, No. 3 are real. Archer, they are real. They were used for two reasons: They were there (they were leftovers that were originally used to manipulate rotor kites above ground turbulence); the other reason was that we wanted to prove that long bridles did not affect Hornbeam's stability.

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PINEY MOUNTAIN AIR FORCE intends to build an ultra-light, powered, man-carrying canard airplane: five to ten horsepower; preferably powered by an electric motor rather than by a gasoline engine. We'll design our own if we have to; but we'd like to hear from other fliers who have similar aspirations, have survived the folly, or would like red-carpet treatment if they decide to use our flightpad as a cross-country harbor or roosting-place.

ASPECT RATIO

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FLYING FIELDS harbor weatherbeaten curmudgeons who wave grimy, line-scarred knuckles all about and wisely allude to the Equation of Bernoulli, lift coefficients, aspect ratio, and all the other good stuff. They always neglect to tell you that knowing the aspect ratio of your kite or airplane does not make it fly a jot—or even a little tittle—better, but they are almost certain to loftily indicate they'd rather be found dead-drunk in a noisome ditch than to be caught flying anything with a low aspect ratio. After meekly absorbing these profound aerodynamic data from The Wise, you could sneak home and wonder: Just what in the hell is aspect ratio? Answer: Aspect ratio simply is a description of the fineness of a wing or dynamic area; that is, how great is its span compared to its average width or chord. That's all.

Then why bother about aspect ratio? Answer: If you don't design and make your own kites, forget about aspect *ratio*; just buy or trade for the ones that have good flight reputations. But if you are designing or building from scratch, you might care to know that high aspect ratio will tend to cause your aircraft to have higher efficiency; it's an efficiency that can be hampered by higher wing-area loading or by poorer stability. Just remember: Burn all the night oil you can afford, study the good aerodynamic textbooks, and limber up the gray matter: but don't be surprised if a design flies decidedly better or worse than you calculated. That is why wind tunnels and test pilots have not gone out of style.

The aspect ratio of a surface is usually defined by most people as the ratio of its span to its chord. This definition is limited to rectangular planforms. It does not apply to tapered, curved, or complex planforms whose chords change with changes in their spanwise locations. Therefore, at least two aspect ratio equations are commonly found in the literature:

$$R = \frac{b}{c} \quad \text{(for the special case of the rectangle)} \qquad (1)$$

$$R = \frac{b^2}{S} \quad \text{(for general cases)} \qquad (2)$$

where

R = aspect ratio
b = extreme span
c = chord of a rectangular wing
S = wing area

For a rectangular wing where

area (S) = span (b) x chord (c), equation (2) reduces to equation (1).

Another equation can be found for aspect ratio, but it's a cop-out:

$$R = \frac{b}{c_m} \qquad (3)$$

where

c_m = mean (or average) chord

Now, how in the devil does an inquisitive flier measure the mean chord of a mean hawk whose primary feathers splay his wingtips like sunbursts? [We know, we know! *Very carefully. . . .*] There are two safe methods that come to mind: The first method would be to weigh a photo-print of a hawk that obligingly flew directly overhead; then carefully cut out the planform of the hawk and weigh that. This relationship would hold:

$$S_h = \frac{W_h \times S_p}{W_p} \qquad (4)$$

where

S_h = area of the hawk cut-out
W_h = weight of the hawk cut-out
S_p = area of the original photo
W_p = weight of the original photo

This hawk-area found with the use of equation (4) is divided into the square of the measured wingspan dimension of the cut-out. Aspect ratio (R) as is defined in equation (2) is thus found. The mean chord is found by changing equation (3) into:

$$c_m = \frac{b}{R} \qquad (5)$$

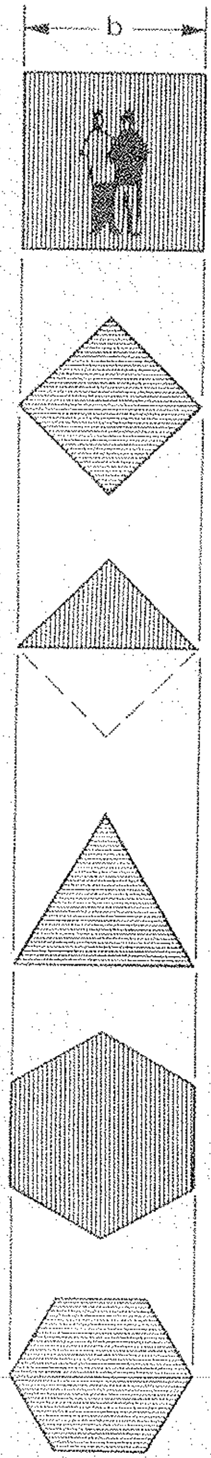
The second method is to find the area by integrating a drawing or photo of the hawk with the aid of a *polar planimeter*, a handsome little instrument that can accurately measure areas of irregular plane figures. The aspect ratios and the mean chords of the birds shown on page 3 were found with the help of a good planimeter.

ASPECT RATIOS FOR SOME COMMONLY USED GEOMETRICAL PLANFORMS

Plus

Numerical constants for Determining Their Areas and Mean Chords

ASPECT RATIOS for the planforms shown below are valid for shapes scaled to any size. Find real Area (S) or real Mean Chord (c_m) by inserting real Span (b) in the equations.



SQUARE
R = 1.000
S = b^2
c_m = b
Side = b

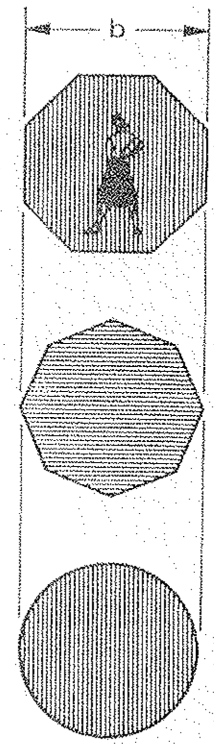
SQUARE
R = 2.000
S = $0.500 \times b^2$
c_m = $0.500 \times b$
Side = $0.707 \times b$

HALF-SQUARE
R = 4.000
S = $0.250 \times b^2$
c_m = $0.250 \times b$
Side = $0.707 \times b$

EQUILATERAL TRIANGLE
R = 2.309
S = $0.433 \times b^2$
c_m = $0.433 \times b$
Side = b

HEXAGON
R = 1.155
S = $0.866 \times b^2$
c_m = $0.866 \times b$
Side = $0.577 \times b$

HEXAGON
R = 1.540
S = $0.650 \times b^2$
c_m = $0.650 \times b$
Side = $0.500 \times b$

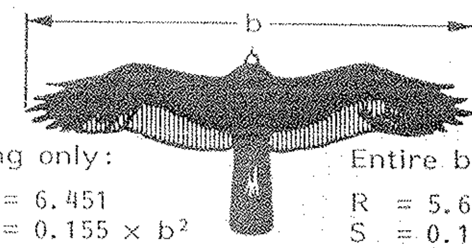


OCTAGON
R = 1.207
S = $0.828 \times b^2$
c_m = $0.828 \times b$
Side = $0.414 \times b$

OCTAGON
R = 1.414
S = $0.707 \times b^2$
c_m = $0.707 \times b$
Side = $0.383 \times b$

CIRCLE
R = 1.273
S = $0.785 \times b^2$
c_m = $0.785 \times b$
Side = none = 0

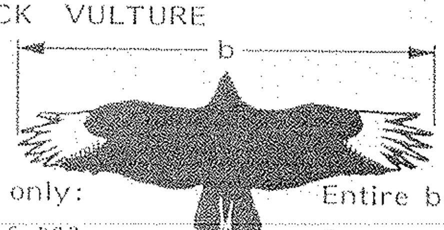
TURKEY VULTURE



Wing only:
R = 6.451
S = $0.155 \times b^2$
c_m = $0.155 \times b$

Entire bird:
R = 5.645
S = $0.177 \times b^2$
c_m = $0.177 \times b$

BLACK VULTURE

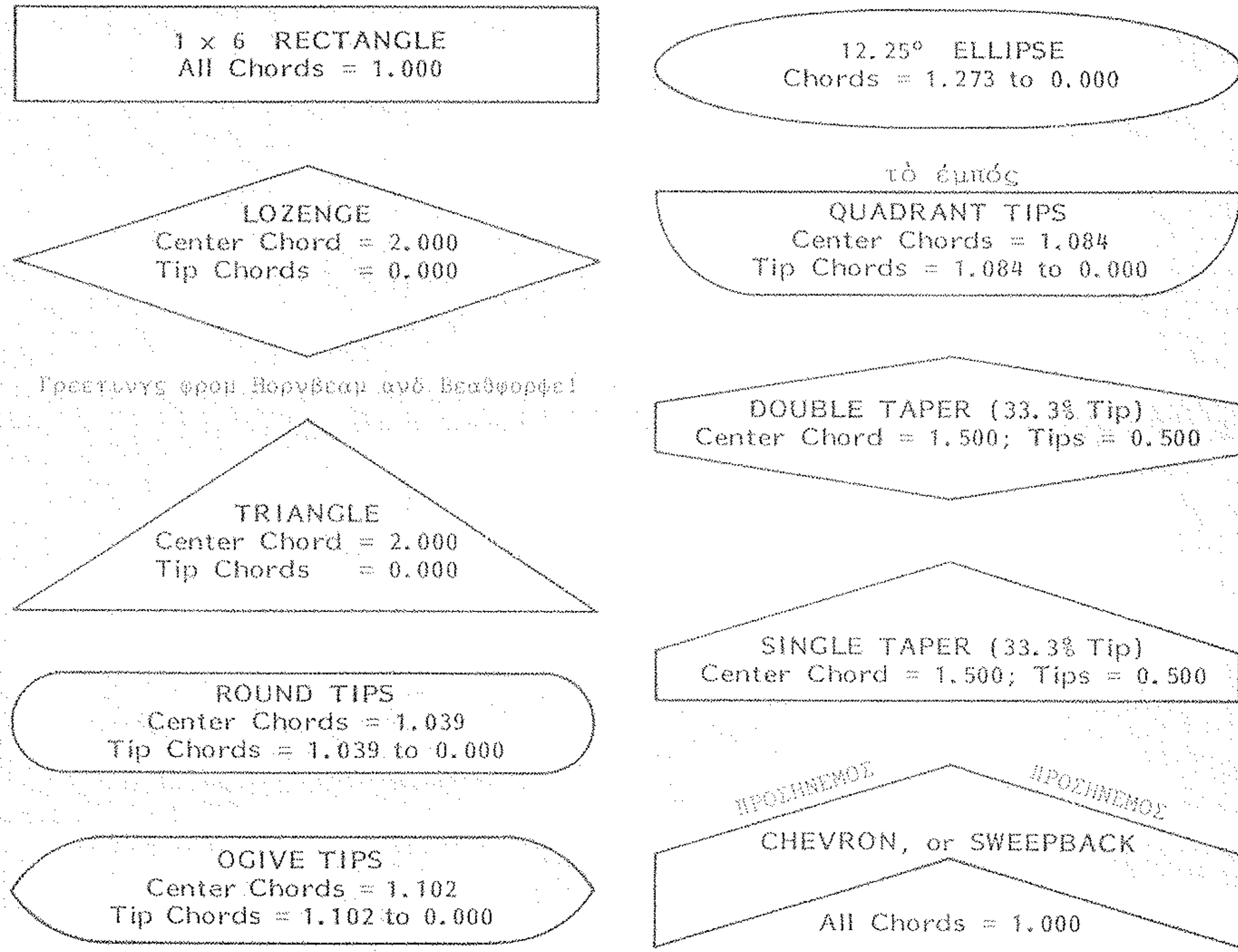


Wing only:
R = 6.403
S = $0.156 \times b^2$
c_m = $0.156 \times b$

Entire bird:
R = 5.650
S = $0.177 \times b^2$
c_m = $0.177 \times b$

A GROUP OF PLANFORMS THAT SHARE A COMMON ASPECT RATIO OF SIX

Span (b) = 6 units; Area (S) = 6 square units; Mean Chord (c_m) = 1 unit



THIS MONTH'S DATA-LETTER contains no kite plan, but we hope it makes up for the lack by presenting some idea stimulators for those who prefer to experiment with their own kite designs. For example, on page 3, isn't it a revelation that if you fly a square as a diamond—points up-and-down—it has an aspect ratio *twice as high* as the same square when it is flown with a side parallel to the horizon? Doesn't that knowledge suggest that two identical squares should be made and flown simultaneously? Does the kite with the aspect ratio of 2.000 fly better than the other? Which requires more tail? Can either be bowed so that it can be flown as a tailless kite? Hint: Alternate the kites so that each is flown in all modes selected for the tests.

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THE SUCCESS OF KITEFLYING largely depends upon pulling and hauling; however, these tensions are most productive when they are restricted to the kiteline and the flying field. —Hornbeam Thatch

BIRD-KITE LOVERS and fanciers of *trompe l'oeil* sky embellishment might care to look for Grossman & Hamlet's *Birds of Prey of the World*. New York: Bonanza books, 1964. Included in the book are 646 silhouettes—bird planforms—of high quality and accuracy (better than our two vultures on page 3). It's a big book; well written.

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PINEY MOUNTAIN AIR FORCE DATA-LETTER
By First Class Mail in the U.S.A.: $7.50 per year
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