PINEY MOUNTAIN AIR FORCE

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DATA☆LETTER

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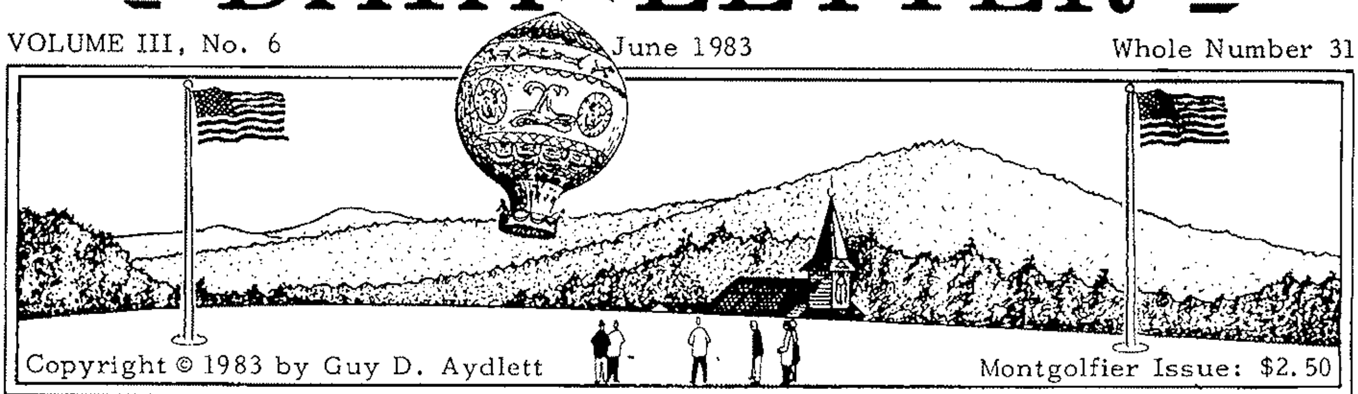


 Montgolfier Issue: $2.50

LITHO IN U.S.A.

JUNE, The Sixth Month, blesses us with 30 days. Expect excellent flying weather and be sure to carefully observe significant events.

On the 1st day of June in 1792, The Commonwealth of Kentucky was admitted as the 15th state; the Liberty Bell was rung in joy.

In 1796, also on the 1st, Tennessee (NOT named after an ancient but potent beverage) became a state. *DL* honors the birthdays of the two states and The Montgolfier Balloon.

The 14th is Flag Day; fly your U.S. colors.

On the 15th of June in 1752, an experimenter named Benjamin rashly flaunted a kite in the ionized teeth of a vigorous thunderstorm.

Don't brew beer on the 18th; the beans may be in blossom. . . .

Summer Solstice and Midsummer's Day are on the 21st; sun all day at 66½° N. Latitude.

Full-mooners, beware: Full Moon is on the 25th, but watch out for that partial eclipse.

1983—MONTGOLFIER BICENTENNIAL YEAR

"BALLOON" was an uncoined word when, on the 4th or 5th of June 1783, a pair of French brothers named Joseph Michel and Jacques Etienne Montgolfier publicly demonstrated the *Montgolfière*, their paper-lined linen envelope buoyantly lifted by its content of heated air.

The 22,500 ft^3 unmanned vehicle—about 35 feet in diameter—rapidly lifted about 6,000 feet above Annonay and converted assembled skeptics into believers of highest conviction.

A brazier of burning charcoal sustained the hot air in the balloon until, following burnout, it settled to earth after a flight of about two miles above folk, farms, and lush vineyards.

Subsequently the popular heroes of France were funded by The French Royal Academy of Science to repeat their experiment; and at Versailles, on 19 September 1783, the brothers inflated and flew their new balloon in the presence of King Louis XVI, Queen Marie Antoinette, Benjamin Franklin, and others.

The passengers—a sheep, a rooster, and a duck—survived the flight and convinced all that human aeronauts might, too, survive the effects of modestly high flights into the mysterious atmosphere. The King offered to man a future flight with two condemned criminals (volunteers, no doubt), but Pilâtre de Rozier begged for the privilege: "Shall vile criminals have the honor of first rising into the sky? I, myself, shall go!" And he became the first to fly successfully. He was raised in a captive—tethered—hot air balloon on 15 October 1783. In the same balloon, de Rozier and his fellow countryman, the Marquis d'Arlandes, made the first free-balloon flight on the 21st of November. They skimmed across Paris at an altitude of 300 feet, passed over the boulevards, and landed safely in the countryside after a twenty-five minute flight that carried the intrepid adventurers more than five miles.

*

TOM GREEN, unlike the Montgolfiers, didn't invent a parachute; but Redeye Wheeler sent Tom's Connecticut fabrication: A flier's parachute didn't open; he plummeted past a fellow riding the other way on a piece of roofing iron. "D'ye know anything about parachutes?" he asked the fellow. "Nope," said the rider, "Whad'ye know about steam boiler explosions?"

AN AIR DENSITY TABLE FOR THE BALLOONIST

by Aaron Awt

AERONAUTS, incipient or active, must take care to ensure that their balloon envelopes are designed to accommodate the gross loads that are to be lifted by their lighter-than-air vehicles. Fundamentally, the lift in all kinds of aerostats happens because the contained gas (hot air, hydrogen, helium, or others) weighs less than the surrounding atmosphere that is displaced by that gas. A good example of positive buoyancy at work is a bubble of carbon dioxide rising to the fragrant surface of a beaker full of vintage champagne. . . . THREE BIG H's work against any aircraft that flys, whether its lift is caused by static buoyancy or by dynamic displacement of the air. The three H's are three *Highs*: *High* altitude, *High* air humidity, and *High* air temperature.

High *altitude*, as evidenced by lower barometric pressure, afflicts the daring aviator or intrepid aeronaut with low density air: it has fewer molecules—is less compacted—just as a high strawstack is less compacted at its top than at its base.

High *humidity*? Doesn't *water* weigh more than *air*? —Not always. The evidence in atmospheric clouds gives us a clue: dry air has more density than air containing water vapor.

High *temperature* applied to a given mass of air causes it to expand—the molecules are farther apart—and its weight per unit of volume (density) is diminished.

Tamper with H #3, and hot air balloons fly!

TABLE OF DRY AIR DENSITIES AT SELECTED TEMPERATURES AND ATMOSPHERIC PRESSURES

Temperature		Barometric Pressure: 750 mm Hg, or 29.53"		Barometric Pressure: 760 mm Hg, or 29.92"		Barometric Pressure: 770 mm Hg, or 30.32"	
°C	°F	kg/m³	oz/ft³	kg/m³	oz/ft³	kg/m³	oz/ft³
0	32	1.2759	1.2744	1.2929	1.2914	1.3100	1.3084
5	41	1.2530	1.2515	1.2697	1.2682	1.2864 ←	1.2849
10	50	1.2309	1.2294	1.2473	1.2458	1.2637	1.2622
15	59	1.2094	1.2080	1.2257	1.2242	1.2418	1.2403
20	68	1.1888	1.1874	1.2047	1.2033	1.2206	1.2191
30	86	1.1496	1.1482	1.1650	1.1636	1.1803	1.1789
40	104	1.1129	1.1116	1.1278	1.1264	1.1426	1.1412
50	122	1.0784	1.0771	1.0928	1.0915	1.1072	1.1059
60	140	1.0461	1.0448	1.0600	1.0587	1.0740	1.0727
70	158	1.0155	1.0143	1.0291	1.0279	1.0426	1.0414
80	176	0.9868	0.9856	0.9999	0.9987	1.0131	1.0119
90	194	0.9596	0.9584	0.9724	0.9712	0.9852	0.9840
100	212	0.9339	0.9328	0.9463	0.9452	0.9588	0.9576
110	230	0.9095	0.9084	0.9216	0.9205	0.9337	0.9326
120	248	0.8864	0.8853	0.8982	0.8971	0.9100	0.9089
130	266	0.8644	0.8633	0.8759	0.8748	0.8874	0.8863
140	284	0.8434	0.8424	0.8547	0.8536	0.8659 ←	0.8649
150	302	0.8235	0.8225	0.8345	0.8335	0.8454	0.8444

Diff. = 0.4205 kilogramme/metre³

○ ○

HOW THE TABLE IS USED — AN EXAMPLE: Propanie gon Dola, Darling Balloonist from The Land of The Fires, plans to hire Piney Mountain Tent and Knicker Company to make a small hot air balloon that can lift her motorized camera rig and, while tethered, record the mating habits of island folk in The Strait.

In her stormy land, good ballooning occurs when the barometer is high and the air cold.

Her radio-controlled camera weighs 3 kilogrammes; she thinks a balloon made of dacron with a 1.25 metre equatorial radius will do the job. Can it lift the camera, a line, and itself?

Propanie has Aaron Awt's air density table and the Beauforce Stringfellow balloon plan.

Under the 770 mm Hg table heading, she finds that 5° C. air weighs 1.2864 kilogrammes per cubic metre. At 140° C. (a safe maximum temperature for dacron), the air density is 0.8659 kg/m³. The difference in air densities yields an *available lift value* of 0.4205 kg/m³.

Propanie calculates the balloon volume to be 9.119 m³; it can lift 3.834 kg. The area is 21.27 m²; envelope weight, 0.638 kg. It'll fly.

"May the wind welcome you with softness; may the sun bless you with his warm hands;

Volume III No. 6 © 1983 Guy D. Aydlett

A MONTGOLFIER BALLOON

by Beauforce Stringfellow

GO FLY A BALLOON is excellent advice for frustrated kitefliers whose winds have quit. Balloon flying is especially appropriate in this bicentennial year of the Montgolfiers' triumph.

Hot air balloons can range from tissue paper toys, barely able to lift their own weight, to exotically crafted man-carriers of thousands of cubic metres in volume.

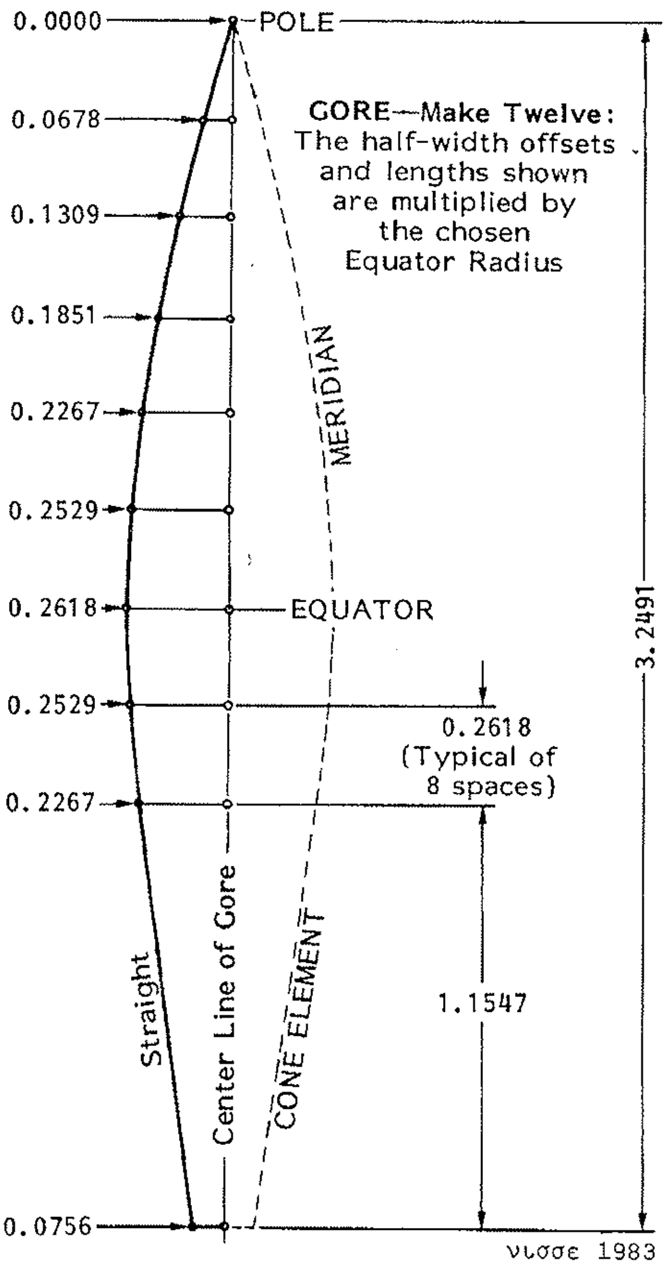
A prudent flier will stop short of using this plan to make a man-carrier; but there is no reason why medium capacity, captive balloons shouldn't be fabricated to hoist photographic gear—or simply to float as a brave decoration.

Small tissue paper balloons may be made up by merely pasting the gore edges to strips of cloth or paper tape. Ripstop gores for large balloons should have hem allowances added to their perimeters. The gores may be sewn to each other, or to strips of webbing tape.

HOT AIR SOURCES—Burn shredded paper in a screen-covered metal container, or consult a bottled gas dealer for valuable suggestions.

Releasing an unmanned free balloon with a sustaining flame can put your hurdies in jail.

"Back again into the loving arms of Mother Earth." —From an old Irish pilot's prayer



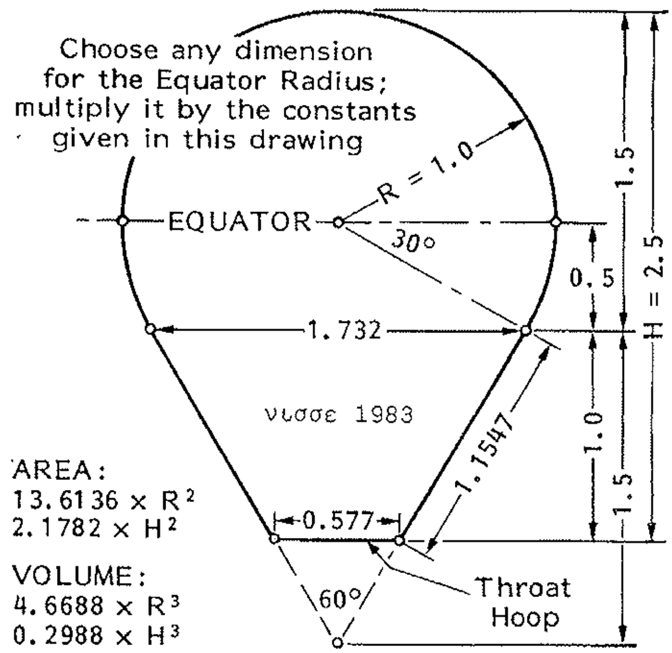


TABLE OF AREAS AND VOLUMES
FOR SELECTED EQUATORIAL RADII

Radius	Area	Volume
1.000	13.614	4.669
1.250	21.271	9.119
1.500	30.631	15.757
1.750	41.692	25.022
2.000	54.454	37.350
2.500	85.085	72.949
3.000	122.522	126.056
3.500	166.766	200.173
4.000	217.817	298.800
4.500	275.675	425.440
5.000	340.339	583.594
6.000	490.088	1008.451
7.000	667.065	1601.383
8.000	871.268	2390.403
9.000	1102.699	3403.523
10.000	1361.357	4668.756

TETRAFLEX MARK I ADDENDA

by Beauforce Stringfellow

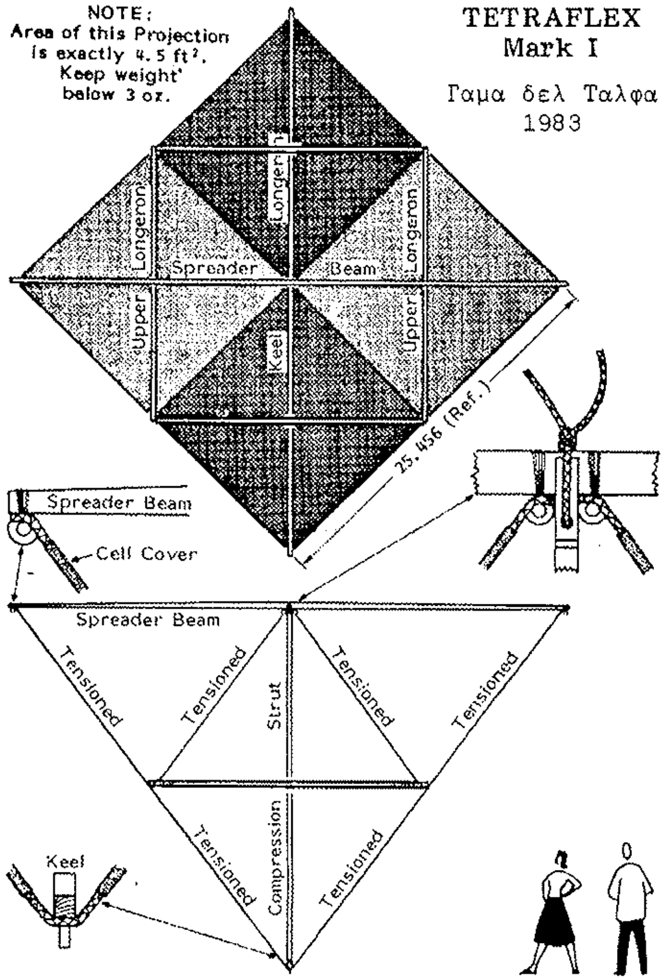
OUR TETRAHEDRAL KITE PLAN in *DL #30* yields a kite that flys exceptionally well in light breezes; but if the wind gusts up more than mild-zephyr velocity, the kite will fly better if short spreaders are fixed across the wingtips of the two lower cells. The spreaders are shown in bold lines in the drawings reproduced (right) from the May 1983 *DL* plan.

Since the plan was published, we had the opportunity to fly Tetraflex in 10 to 15 mph winds and noticed that the inboard wings of the two upper cells tended to slacken—lose tension—flap about and degrade performance.

Spreaders made of 0.125" square spruce or 0.188" diameter birch dowel handsomely stiffened the structure for good performance in winds greater than those for which the kite was designed.

Of interest in higher wind testing was the evidence that the three upper cells bellied downwind in Eddy fashion, but the lowermost cell bellied towards the flier-observer; had *negative pressure* as does the stabilizers on most conventional airplanes. This condition was observable because of the flexible perimeter of the cell coverings; a condition that is difficult to detect in conventional rigid cells.

BRIDLING—A two-legged bridle was found to be better than the commonly seen direct kite-line attachment, or single bridle. The upper branch or leg was attached to point "H"; the lower was attached to "L," mid-point of the lower cell keel. By having legs in a continuous loop of line with a larks-head knot and a brass split-ring, the bridle was capable of being easily tuned for best angle of attack.



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ADRIAN CONN of Windsor, Ontario, Canada is the "Canadian gentleman of perspicacity and great taste" whose puff-ball kite tail was so admired by Carl Poehler (*DL #30*, page 2). Adrian is now a *DATA LETTER* subscriber.

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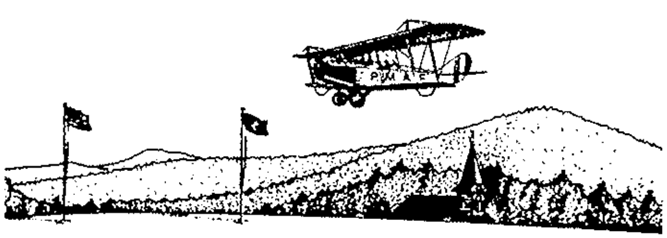

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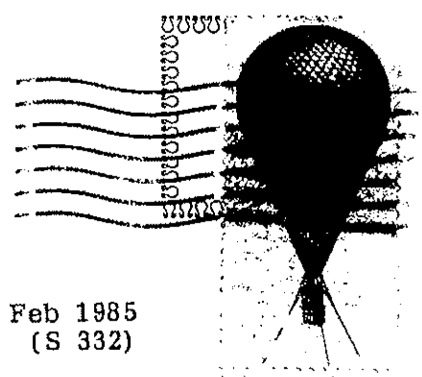

Feb 1985
(S 332)

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