The Pazmany Efficiency Contest . . . Make It Work For You!

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WHERE CAN YOUR airplane be improved? Could your piloting technique be refined? How do you stack up among your peers? How does your jewel of an airplane perform, compared to other airplanes of its class?

We can get answers to some of these questions by taking another, closer look at the information developed from the past few years of flying the Pazmany Efficiency Contest. The data can be recomputed as an aerodynamic handicapping factor multiplied by the speed achieved during the timed flight. From the aircraft data one handicap factor is computed for the low speed flight and another handicapping factor is used for the high speed flight. This handicapping is very similar in nature to the handicapping used in other competitive sports and allows the minimum speed performance of a Taylorcraft to be compared with a Taylor Titch, for example.

Let's examine the low speed portion of the efficiency equation first. Stall speed for a given airfoil varies in direct relation to the square root of the wing loading, so the low speed handicap factor becomes the inverse of that expression or

$$H_{Slow} = \frac{1}{\sqrt{\frac{W}{S}}}$$

Beginning here, we can begin to compare Cubs against Sidewinders and Taylorcrafts against T-18's. Flaps lower the stall speed of an airfoil — right? How do you explain, then, the fact that the handicapped low speed performance of the Cubs and Taylorcrafts is as good or better than the T-18's and Sidewinders?

It is here that we can start to ask about our own piloting technique. How well do you stack up when riding the stall? Do you really know your airplane, or do you just ride in it?

All T-18's, for example, should be able to achieve the same handicapped stall speed as the airfoils and flap systems are virtually identical. Yet, the handicapped minimum speed figures show a surprising variation.

Actually, T-18's, Tailwinds, Turner T-40's, Davis DA-2A's, Sidewinder's, Mustang II's and BD-4's should be able to acheive nearly identical handicapped low speeds. The fact that they don't may show a need for refinement on the wings of some of these aircraft. I suspect pilot technique is a far greater variable, however.

In trying for the all-out efficiency coefficient, the low-speed performance of the airplane-aviator combination cannot be over emphasized. Reducing the minimum speed by three mph has about the same influence on the overall points score as a nine mph increase in the maximum speed! If you don't believe it, try the numbers on a high scoring airplane and see for yourself.

"Power required goes up as the cube of the airspeed." That's a pretty common statement. By reworking this expression we arrive at an equivalent expression that says the maximum speed is proportional to the cube root of the ratio of power to drag producing area — the wing, in this contest. If you can figure out how to eliminate the fuselage, you are ahead of the game.

From this discussion, we can see why the maximum speed handicap factor is

$$H_{Fast} = \frac{1}{\sqrt[3]{\frac{P}{S}}}$$

Comparing the handicapped high speed of your homebuilt against the handicapped high speed for others of its class or type tells how your airplane measures up aerodynamically. Compare your bird against the top performer of its type. What is different? Do your wheel pants fit as tight? Did he work out a better solution with his antennas? Are your gap seals as good as his?

If these visible details are very similar, perhaps you could get him to show you his cowling and cooling system details. On a clean homebuilt, 10% of the net power is required for cooling, and this figure can be doubled or tripled. Perhaps your own cooling system can be improved to give you both extra speed and improved cooling.

Another nearly invisible area to explore is engine operation and the engine/propeller combination. Many builders are now observing that their own cars cruise all day at 3000-3500 rpm. Yet, the more carefully built aircraft engine is operated at 2500-2700 rpm, apparently due to engine balance tolerances and propeller tip speed limitations while swinging a six foot club. Consequently, since many of the faster homebuilts are limited to smaller propellers, the builders are balancing the engines and using 3000+ rpm as their maximum.

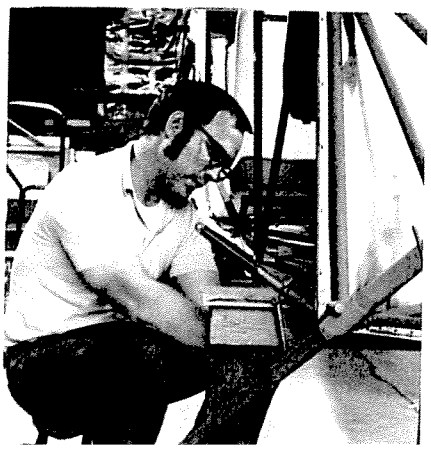
K_3, the coefficient of performance, then, is determined by dividing the handicapped maximum speed by the handicapped minimum speed. Interestingly, after breaking down the Pazmany Efficiency Equation to this more useable form, the K_3, is identical to the value computed directly from the formula. The timers are there for you and me to use in refining our own airplanes! Let's use them!

Judging from the articles that have appeared in *SPORT AVIATION* many people had been searching for a method of comparing the performance of airplanes that are very different. Pazmany has done all of us an outstanding service by providing his Efficiency Equation! Men like Noel Becar, Ray Borst and Art Froelich and all the men who built the equipment, and helped run the contest, as well as the owners and pilots who made the effort to fly the contest, deserved our appreciation for developing the data we now have available.

I became interested in the Pazmany Efficiency Equation first from a designers' viewpoint because it allows a builder to compare a Fournier RF-4 against a Comanche, for example. Now, as a builder, it will allow me to compare my Tailwind against other Tailwinds, the T-18's, and the BD-4's. How effective will my streamlining approaches be when compared to some of the best? I can hardly wait to get my bird off the ground and through the traps!

(Continued on Next Page)

ABOUT THE AUTHOR — Philip Groelz is a registered professional engineer in the state of Nebraska and graduated from the University of Nebraska with a B.S. degree in electrical engineering. Philip is the current president of EAA Chapter 80 which serves Eastern Nebraska and Western Iowa. He is shown attaching fabric to the belly of his Tailwind.



HIGH SPEED RUN

Aircraft	Pilot	Year	Mph	HFast
Vans RV-3	Van Grunsven	'73	207.6	186.0
Sidewinder	Smyth	'71	180.1	180.5
Taylor Mono	Crossland	'73	146.3	169.7
KR-1	Rand	'73	140.8	169.0
Mustang II	Bushby	'73	198.0	165.9
Sonerai II	Monnett	'73	147.4	164.9
Daphne	Darmstadt	'71	139.8	162.2
T-18	Zimmerman	'71	187.0	161.8
Mustang II	Chard	'73	194.8	161.5
Piper Arrow	Vonheeder	'73	168.0	159.1
Swift	Kingry	'71	154.5	158.5
Cessna 170A	Williams	'73	158.8	158.2
Skeeter	Eaves	'71	168.8	154.8
Bellanca	De Franco	'73	174.0	154.7
VS-1	Vidervol	'71	128.0	153.3
Zenith	Heintz	'73	150.9	153.2
Tailwind	Tileston	'70	174.2	152.2
T-18	Giller	'73	184.0	149.6
Mustang II	Bushby	'71	179.9	149.5
Tailwind	Stanton	'71	150.0	149.1
Jodel D-11	Hodkinson	'73	125.7	146.8
Tailwind	Korngold	'70	151.2	146.7
Cliff	Smith	'71	125.7	146.6
Mooney Mite	Willingham	'71	122.0	145.4
Cessna 150	Jania	'73	125.1	145.4
Skyhopper	Shinn	'71	115.8	145.0
Taylor	Ladd	'71	115.2	144.8
El Chuparosa	Hegy	'71	139.2	144.6
Jodel F-11	Carlson	'73	122.6	144.1
Playboy	Hawley	'73	155.7	144.0
Turner T-40.	Darst	'73	152.7	143.8
Tailwind	Carter	'71	147.6	141.3
MacDonald S-20	MacDonald	'73	111.5	140.5
Pazmany PL-1	Brewer	'73	155.1	137.1
T-18	Hamlyn	'70	154.5	136.4
Jodel D-11	Zimmerman	'73	106.2	136.1
Fleet Canuck	Tee	'73	105.9	136.1
Lark	Voto	'71	129.0	135.6
Turbulent	Weishaar	'73	100.6	135.3
T-18	Wallace	'71	161.0	134.8
T-18	Neunteufel	'71	170.8	134.2
PJ-260	Pfouts	'71	141.7	134.0
Pipit	Sisler	'71	121.8	134.0
Taylorcraft	Hall	'73	95.5	133.7
Luscombe	Reid	'70	114.0	133.5
Taylor	Linn	'70	122.3	133.1
PL-2	Pio	'71	135.8	132.8
Starduster	Bookwalter	'71	138.2	132.4
Fly Baby	Mezharsic	'73	107.3	132.0
T-18	Gonzales	'73	148.9	131.6
Honey Bee	Mooney	'70	113.4	131.3
T-Craft	Olsen	'71	91.7	131.0
Davis	Lange	'71	131.7	130.6
Stinson 108	Royal	'73	136.4	129.9
Playboy	Pulliam	'70	128.3	127.8
Playmate	Balcer	'73	135.5	127.1
Maranda RA-14	Boudeau	'73	112.7	125.7
Jodel D-11 or F-11	Callahan	'70	101.6	125.0
Aeronca	Lamb	'70	99.1	124.4
Tailwind	Johnson	'71	142.7	124.3
Skyscooter	Thorp	'70	105.5	123.5
Tailwind	McAdams	'71	132.0	123.2
Commonwealth Sky Ranger	Barnard	'73	96.8	120.8
Jeanie's Teeny	Parker	'71	108.8	120.7
Playmate	Balcer	'71	120.2	120.3
Pietenpol	Lovley	'71	77.4	118.9
Skycoupe	Carrithers	'70	97.6	117.5
Mod-Cub	Brown	'71	90.5	117.5
Skycoupe	Hall	'71	116.0	117.4
Fly-Baby	Ingram	'71	95.2	117.1
Jodel D-11 or F-11	Putney	'70	88.2	113.8
Miniplane	Martin	'70	122.8	113.6
Baby Ace	Jania	'73	90.3	110.0
Miniplane	Schuster	'70	101.5	106.1
J-3 Cub	McKinney	'70	82.8	105.5
Miniplane	Janson	'70	99.5	104.5
Fly-Baby	Campbell	'73	82.9	102.0
Skycoupe	Reely	'70	91.6	96.5

SLOW SPEED RUN

Aircraft	Pilot	Year	Mph	HSlow
Aeronca	Lamb	'70	36.9	14.04
Stinson 108	Royal	'73	47.3	14.20
Cessna 150	Jania	'73	43.7	14.97
T-Craft	Olsen	'71	36.6	15.41
Pietenpol	Lovley	'71	38.0	15.51
Vans RV-3	Van Grunsven	'73	53.9	15.63
Cessna 170A	Williams	'73	52.2	15.68
Luscombe	Reid	'70	48.7	15.84
T-18	Wallace	'71	60.0	15.92
Zenith	Heintz	'73	52.2	15.96
Tailwind	Johnson	'71	57.7	16.03
KR-1	Rand	'73	46.8	16.19
J-3 Cub	McKinney	'70	40.1	16.20
Davis DA-2A	Lange	'71	56.5	16.21
Playboy	Pulliam	'70	54.6	16.32
Skyscooter	Thorp	'70	48.7	16.40
T-18	Zimmerman	'71	61.2	16.42
Tailwind	Carter	'71	56.1	16.45
Mod-Cub	Brown	'71	43.3	16.62
Jodel F-11	Carlson	'73	45.6	16.76
Lark	Voto	'71	53.5	16.82
Taylor	Linn	'70	52.5	16.85
Tailwind	Korngold	'70	65.0	16.88
VS-1	Vidervol	'71	48.9	17.01
PL-1	Brewer	'73	62.6	17.10
Bellanca	DeFranco	'73	67.4	17.11
Mooney Mite	Willingham	'71	45.2	17.12
Daphne	Darmstadt	'71	48.7	17.39
Tailwind	Tileston	'70	68.2	17.45
T-18	Giller	'73	68.0	17.53
Skeeter	Eaves	'71	62.2	17.54
Skycoupe	Hall	'71	54.9	17.60
PL-2	Pio	'71	62.0	17.61
Miniplane	Schuster	'70	54.6	17.68
Turbulent	Weishaar	'73	51.6	17.79
Commonwealth Sky Ranger	Barnard	'73	50.9	17.92
PJ-260	Pfouts	'71	55.5	18.08
Cliff	Smith	'71	53.7	18.10
Jodel D-11 or F-11	Putney	'70	50.3	18.22
Mustang II	Bushby	'71	72.0	18.29
Jodel D-11 or F-11	Callahan	'70	47.6	18.31
Tailwind	McAdams	'71	70.0	18.35
Taylor	Ladd	'71	56.9	18.47
Baby Ace	Jania	'73	50.8	18.47
T-18	Neunteufel	'71	70.5	18.55
Miniplane	Martin	'70	55.3	18.62
Pipit	Sisler	'71	56.8	18.75
Swift	Kingry	'71	61.1	19.09
Fly Baby	Campbell	'73	52.9	19.10
Jodel D-11	Zimmerman	'73	52.9	19.10
Fly Baby	Mezharsic	'73	54.3	19.12
Skycoupe	Reely	'70	56.3	19.15
MacDonald S-20	MacDonald	'73	52.8	19.20
Mustang II	Bushby	'71	69.3	19.36
Playmate	Balcer	'73	64.9	19.42
Taylor Mono	Crossland	'73	63.2	19.51
Starduster	Bookwalter	'71	59.4	19.58
Maranda RA-14	Boudeau	'73	52.5	19.58
Fly Baby	Ingram	'71	54.1	19.67
Jeanie's Teeny	Parker	'71	61.2	19.69
Playmate	Balcer	'71	64.4	20.00
Skyhopper	Shinn	'71	55.5	20.07
Fleet Canuck	Tee	'73	58.8	20.21
T-18	Gonzales	'73	79.3	20.23
Miniplane	Janson	'70	62.5	20.23
Turner T-40	Darst	'73	79.2	20.26
Playboy	Hawley	'73	69.4	20.72
Starduster	Lance	'70	65.5	20.73
Taylorcraft	Hall	'73	49.4	20.83
Tailwind	Stanton	'71	72.0	21.02
Honey Bee	Mooney	'70	62.4	21.08
Jodel D-11	Hodkinson	'73	65.6	21.59
El Chuparosa	Hegy	'71	64.7	21.86
T-18	Hamlyn	'70	80.0	22.04
Skycoupe	Carrithers	'70	63.5	22.28
Piper Arrow	Vonheeder	'73	81.0	22.31
Sonerai II	Monnett	'73	65.9	22.57
Sidewinder	Smyth	'71	72.8	23.37
Mustang II	Chard	'73	87.5	23.72

'70 data from July 1970, *SPORT AVIATION.*
'71 data from July 1971, *SPORT AVIATION.*
'73 data from October 1973, *SPORT AVIATION.*

placement of 680.4 cubic inches; a big, long Ham Standard prop that puts cruise horsepower to use at only 2,000 rpms; an all-up weight of 3934 pounds — nearly 1500 pounds more than any other aircraft in the contest; 258 square feet of wing area; a top speed through the traps of a very creditable 164.048 mph and a slow speed run at only 51.337. Only the Cubs, Champs, Vagabonds, Pietenpols and, significantly, Eric Glew's Diamant were slower. In 1937 very few runways in the U. S. (or anywhere else) were paved and very few exceeded 3000 feet in length. The Stinson and its contemporaries were designed to safely operate at gross weight from these runways . . . and did so magnificently.

So, why don't they still make the Gullwing, the Waco Cabins, the Staggerwings, Howards, etc., if they were so great? For one thing those big radials inhale huge gulps of gasoline every time an intake valve pops open and for another, these 4-5 place tube and fabric birds were labor intensive . . . nothing says it more succinctly than the fact that when, in 1947, Beech launched a new generation of business aircraft with its Bonanza, the V-tailed wonder was offered for $7,345 . . . while a postwar G17S Staggerwing had a base price of $29,000! These aircraft were, from the standpoint of energy and labor costs, of a different era . . . an era we will not see again. Think kind thoughts and smile a little when next you walk by one of these old birds at a fly-in, and admire the owner for saving it for a little while longer to remind us of the path behind. The Great Depression of the '30s was a bad time, but a lot of good things came out of the period, nevertheless.

Glen Cawley is Chief of Property Rehabilitation with the General Services Administraton for the Western United States and owns and lives on the South Prairie Airport near Seattle. In addition to the Stinson, he owns a Stearman that he has just completely restored. EAAers in the area report it is a superb piece of workmanship. Glen also has a PT-22 and several other antique aircraft. He has owned the Stinson for nearly 7 years and took 2 years restoring it. He has an instructor's rating and flies sailplanes in addition to his antique aircraft.

The showing of the big Stinson serves to emphasize the performance of Eric Glew's Piel Diamant. Finishing a close second with a K Factor of 11.309, it did so with approximately half the horsepower, wing area and all-up weight. The Diamant won't carry 5 people but it does a whale of a job for 2 or 3 on about 8 gallons per hour.

The hot rods were led by Les Berven in Bede Aircraft's Xenoah powered BD-5 demonstrator. He turned in the highest speed yet recorded at Oshkosh — 216.02 mph. Interestingly, Jack White blasted through the traps at 199.03 in his 0-200 powered Midget Mustang, 5 mph faster than Jim Butler's retractable gear version with the same engine. One would immediately look to the props for an answer to this puzzler. Jim uses a metal McCauley cut down to 60 inches and with a 68 inch pitch. Jack uses a wooden stick carved by the ol' master, Ole Fahlin. It is also 60 inches in diameter but has a 70 inch pitch. It would be interesting to see what would happen if the two exchanged propellers for a couple of passes through the traps.

Another interesting match-up that can be picked out of the tables involves the KR-2 and the Sonerai II. Both were VW powered (with both claiming 60 hp even though Ken Rand was running an 1834 cc and Greg Erickson a 1700 cc VW in the Sonerai), each was using Warnke ground adjustable propellers and each was flying the contest with just the pilot aboard (Greg made a second run with a passenger . . . which makes for still more interesting comparisons). Top speeds were virtually identical — with a miniscule .698 mph edge in favor of the Sonerai II. The KR-2 had a 6.655 mph advantage on the slow speed end. The variables in this case were the fron-

(Dick Stouffer Photo)
Eric Glew of Toronto was the "most efficient" among the homebuilts in the 1975 Pazmany contest. Eric received the Mechanix Illustrated Award for outstanding Workmanship for this Piel Diamant at Oshkosh '74.

tal areas presented by the side-by-side KR-2 vs. the tandem Sonerai II, retractable gear vs. fixed gear, the 78.5 pound lighter weight of the KR-2, the foam and Dynel surface finish vs. doped fabric and metal wings of the Sonerai, etc., etc. There's enough good stuff here just comparing these two designs to run a Chapter meeting into an all-night session . . . or two.

These many examples of serendipity — the intriguing fallout quite aside from the main purpose of the Pazmany contest — make the competition more than worthwhile. We need more aircraft entered next year . . . more designs than what you see in the charts below and a number of each for type comparisons. And we need a few of Wichita's and Vero Beach's finest competing to act as standards for the homebuilts to strive to better.

A little competition is not going to hurt the homebuilt movement in the least. We know of one competitor in the list below who is feverishly working to improve the performance of his aircraft — a turbocharger and a hydraulic, constant speed metal propeller are being developed and should be on his plane at Oshkosh '76.

The rest of you guys better get humpin'.

(Dick Stouffer Photo)

Ed Merkel's all metal biplane, the Merkel Mk. II.

(Photo by Jack Cox)

N503BD, the factory BD-5 flown by Les Berven to second place in the Custom Built category of the contest. Les turned in a top speed of 216.02 mph, the highest recorded in a contest at Oshkosh. Corkey Fornof is in the aircraft in this photo.

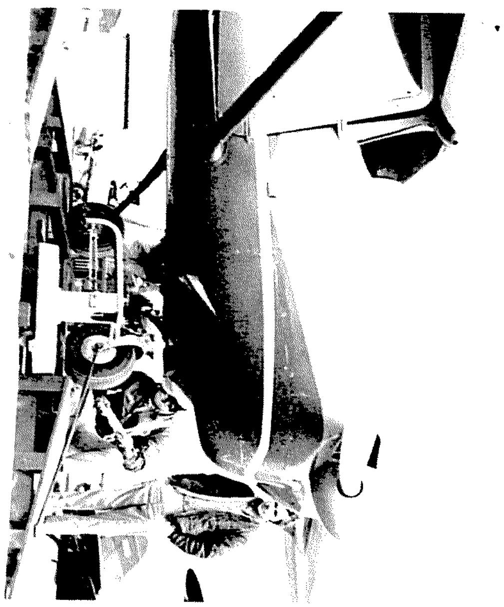
Aircraft	N Number	Pilot	Engine	H.P.	Propeller	Dia.	Pitch	Weight	Area (Ft.²)	S/P	W/S	$\sqrt[3]{S/P}$	$\sqrt{W/S}$	V Max.	V Min.	V Max. / V Min.	K³	°F	Bar.	Wind	Dir.	Place
FACTORY BUILT																						
Stinson Reliant	N18406	Glen Cawley	Lyc. R-680-13	300	Hamilton Standard	100	V.P.	3934	258	.860	15.248	.951	3.905	164.048	51.337	3.195	11.865	71	30.60	0-1	180°	1
Bellanca 14-19	N506A	Dale Tuner	Lyc.	190	Hartzel		C.S.	2421	161	.847	15.037	.946	3.878	168.23	60.38	2.786	10.224	69	30.60	4-5	190°	2
Beech Bonanza	N4427D	Arthur Grazia	Cont.	225	Hartzel	72	C.S.	2408	181	.804	13.304	.930	3.647	173.226	58.638	2.954	10.019	70	30.11	4-5	220°	3
Bellanca 14-13-2	N86881	Dan Cullman	Franklin	180	McCauley	76	C.S.	1862	161	.894	11.565	.963	3.401	164.24	65.01	2.932	9.608	70	30.52	4-6	190°	4
Aeronca 7AC	N85077	Donald Brower	Cont.	65	McCauley	74	45	1073	154	2.369	6.968	1.333	2.640	90.60	41.35	2.191	7.711	69	30.60	0	—	5
Piper PA-17	N4658H	Ben Ellison	Cont.	85		72	48	1113	147	1.729	7.571	1.200	2.752	107.25	47.09	2.278	7.522	72	30.52	4-5	190°	6
Piper J-3	N33561	Bob Townsend	Cont.	65	Sensenich	72	42	1037	175.9	2.706	5.895	1.394	2.428	85.09	41.255	2.063	6.979	73	30.60	1-2	180°	7
CUSTOM BUILT																						
Piel Diamant	CF-YQH	Eric Glew	Lyc. 0-320	150	Aeromatic	72	66	1677	123	.820	13.634	.936	3.692	160.43	49.03	3.272	11.309	69	30.60	0	—	1
BD-5	N503BD	Les Berven	Xenoah	62	Sensenich	46	53	655	47.4	.765	14.030	.914	3.746	216.02	72.007	3.000	10.275	73	30.60	0	—	2
Midget Mustang	N14LB	Lloyd Butler	Cont. 0-200	100	McCauley	60	68	1006	68	.680	14.794	.879	3.896	194.00	66.56	2.915	9.858	69	30.60	4-6	190°	3
Zenith	CF-EYC	Chris Heintz	Cont. 0-200	100	McCauley	72	50	1355	105	1.050	12.905	1.016	3.592	148.038	55.715	2.657	9.702	72	30.60	0-2	180°	4
KR-2	N4KR	Ken Rand	VW 1834	60	Warnke	52	60	684	80	1.333	8.550	1.101	2.924	155.09	52.52	2.955	9.513	71	30.11	2-3	220°	5
Midget Mustang	N190A	Jack White	Cont. 0-200	100	Fahlin	60	70	875.5	76	1.333	8.550	1.101	2.924	155.09	52.52	2.955	9.513	71	30.11	2-3	220°	5
Sonerai II	N2MX	Greg Erikson	VW 1700	60	Warnke	50	40	762.5	84	.76	11.520	.913	3.394	199.03	66.98	2.971	9.204	84	30.20	8	210°	6
Emeraude	N4702	Ralph Bowles	Cont.	85	(Homemade)	70	50	1387.6	117	1.400	9.077	1.119	3.013	155.788	59.175	2.633	8.873	73	30.60	0-3	180°	7
Sonerai II	N2MX	Greg Erikson	VW 1700	60	Warnke	50	40	912.5	84	1.376	11.859	1.112	3.444	121.482	52.800	2.301	8.814	70	30.60	0	—	8
Merkel Mk. II	N38225	Ed Merkel	Franklin	220	Hartzel	80	C.S.	1495	145	1.400	10.863	1.119	3.296	150.220	64.246	2.338	8.621	73	30.60	0-3	180°	9
Messersnipe	N1672	Cliff Sterrenburg	Lyc. 0-290	125	Sensenich	74	54	1321	155	.659	10.310	.870	3.211	161.11	57.503	2.802	7.829	69	30.18	5-8	210°	10
Mono Z	C-GNYM	Gerry Boudreau	VW 1700	60	Steinheibler	58	34	893	91	1.240	8.523	1.074	2.919	130.94	53.78	2.435	7.637	72	30.52	4-9	190°	11
Pietenpol	N23QB	Zara Royal	Cont.	65	Sensenich	72	44	847	145	1.517	9.813	1.149	3.133	106.223	51.555	2.060	7.415	71	30.60	0-2	180°	12
Midget Mustang	CF-FOW	R. Affleck	Cont. 0-200	100	Reese-Shores	54	50	929	80	.800	11.613	.928	3.408	173.41	82.00	2.115	6.688	76	30.52	8-10	190°	14

PAZMANY EFFICIENCY CONTEST RESULTS
Sport Aviation. Aug 1975

AIRCRAFT	N NUMBER	WT. POUNDS	S - FT.²	S/P	S/P*	W/S	W/S	V MAX	V MIN	V MAX/V MIN	"K₃"	PLACE OVERALL	PLACE CATEGORY	PILOT	ENGINE	HORSEPOWER	PROPELLER	DIAMETER	PITCH	TEMP. F°	BAROMETER	V WIND	DIRECTION °
Cessna 210 (F)	9478T	2584	163.75	.630	.857	15.780	3.972	215.83	58.62	3.68	12.53	1	(1)	Joe Jania	Cont.	260	McCauley	82.5	CS	61	30.03	0-1	290°
Van's RV-3 (H)	17 RV	1056	90	.770	.896	11.733	3.425	204.523	50.383	4.059	12.456	2	1	R. VanGrunsven	Lyc.	125	Sensenich	68	71	62	30.08	5	250°
Hawker Hurricane (H)	33000	1352	100.2	.668	.874	13.493	3.673	193.55	55.60	3.48	11.17	3	2	F. Sindlinger	Lyc.	150	Hartzell	72	CS				
Mooney Mk. 21 (F)	1 MZ	2599.5	167	.928	.975	15.566	3.945	182.54	64.281	2.839	10.920	4	(2)	M. Zeller	Lyc.	180	Hartzell	72	CS	61	30.08	5	250°
Taylor Titch (H)	14J	825.5	80	.941	.980	10.319	3.212	177.515	52.219	3.399	10.701	5	3	J. Miller	Cont.	85	Ted Hendrickson	56*		61	30.08	0	
Bellanca 14-19 (F)	9808B	2421	161.5	.702	.889	14.991	3.872	184.241	59.976	3.072	10.579	6	(3)	A. DeFranco	Cont.	230	Hartzell	76	CS	65	30.08	8	240°
Maule (F)	51629	1795	157.9	.718	.895	11.368	3.372	162.894	46.479	3.505	10.577	7	(4)	Ed Hay	Frank.	220	McCauley	74	CS	69	30.08	5	250°
Midget Mustang (H)	14LB	988	68	.680	.879	14.529	3.812	218.98	71.68	3.05	10.22	8	4	L. Butler	Cont.	100	McCauley	60	68				
Diamant (H)	CF-YQH	1375	123	.820	.936	11.163	3.341	172.903	52.968	3.264	10.207	9	5	E. Glew	Cont.	150		72	61	66	30.08	8	240°
Thorp T-18 (H)	4784G	1293	88	.652	.867	14.693	3.833	198.864	68.265	2.913	9.680	10	6	B. J. Shinn	Lyc.	135	Sensenich	70	70	62	30.08	5	250°
Fournier RF4D (F)	7725	834	121.5	3.375	1.500	6.864	2.620	128.057	52.200	2.453	9.640	11	(5)	J. Buckner	VW	36	Hoffmann	52.4	34	70	30.08	8	240°
Mustang II (H)	72PC	1372	98	.653	.868	14.00	3.742	193.861	66.262	2.926	9.499	12	7	P. Cox	Lyc.	150	Sensenich	74	68	60	30.08	0	
Cessna 150 (F)	66001	1413	161.5	1.615	1.172	8.750	2.96	128.62	47.51	2.71	9.40	13	(6)	J. Hiller	Cont.	100	McCauley	69	48	80	30.03	0-1	290°
Zenith (H)	C-FEYZ	1170.5	105	1.050	1.016	11.148	3.339	164.387	60.570	2.714	9.207	14	8	C. Heintz	Cont.	100	McCauley	72	42	67	30.08	8	240°
Daphne (H)	3735	1150	130	1.444	1.130	8.846	2.974	125.654	45.907	2.737	9.198	15	9	R. Kirk	Cont.	90	McCauley	68	55	61	30.08	0	
Swift (F)	10SS	1531	132	.880	.958	11.598	3.406	176.73	66.33	2.66	8.68	16	(7)	B. Shepherd	Lyc.	150	Hartzell	69	CS	80	30.03	0-1	290°
Emeraude (H)	CF-TWA	1198	118	1.093	1.030	10.153	3.186	142.171	54.359	2.615	8.582	17	10	T. Algeo	Lyc.	108	Schauss	70	56	63	30.08	5	250°
Fournier RF4D (F)	7723	939	121.5	2.025	1.265	7.728	2.780	126.057	52.542	2.399	8.438	18	(8)	C. Webber	VW	60	Trigg			70	30.08	8	240°
Aeronca Chief (F)	23586	1068	162.2	2.495	1.356	6.584	2.566	104.020	45.752	2.274	7.912	19	(9)	B. VanWagnen	Cont.	65	McCauley	74	42	68	30.08	8	240°
Piper Super Cub (F)	7847H	1443	185	1.156	1.050	7.800	2.793	127.115	48.780	2.606	7.642	20	(10)	L. Koberg	Lyc.	160	Sensenich	72	50	60	30.08	0	
Headwind (H)	73JR	791	110	1.930	1.245	7.236	2.690	95.16	42.31	2.25	7.535	21	11	D. Stewart	VW	57	Hegy	66	33				
Commonwealth (F)	73806	1210	165	1.941	1.247	7.333	2.708	107.43	48.27	2.23	7.530	22	(11)	W. Bernard	Cont.	85	McCauley	71	51				
Commonwealth (F)	92904	1380	165	1.941	1.247	8.364	2.892	107.077	53.660	1.995	7.195	23	(12)	B. Henk	Cont.	85	McCauley	71	44	69	30.08	8	240°
Brown B-2 (H)	255Y	1274	87	.435	.758	14.701	3.834	179.10	77.52	2.31	6.71	24	12	B. Turner	Ranger	200	Curtiss Reed						

PLACE CATEGORY —
1 - Homebuilts
(1) - Factory Aircraft

* 3-Blade



(Photos by Jim Lamalfa)