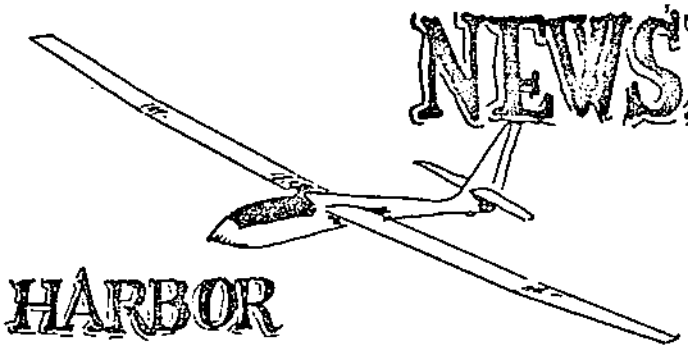

HARBOR SOARING SOCIETY

NEWSLETTER

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P. O. Box 1673, Costa Mesa, Ca. 92626

President	Frank Chasteler	545-2185
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Contest Dir	Mike Costello	963-9881
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November Meeting

The Harbor Soaring Society will meet on Wednesday November 7th at 7:30 PM. The meeting will be held at the Costa Mesa Water District office located at 1965 Placentia street in Costa Mesa. Nominations for club officers will be presented. We have a problem here because Dan Fink our nominating commitee could not find anyone that wanted to be nominated. At the last meeting we came up short 7 votes to pass the amendments to the club's constitution, so if you did not vote yet fill out the ballot in the Sept. newsletter and send it in, or bring it with you to the meeting.

November Contest

The next club contest is on sunday November 11th at 9:00 AM. Brent Foster is the contest director. The tasks for this contest are to be a 3 minute precision, 700 flight-300 landing; a 5 minute precision-duration, 900-100; and a 7 minute precision-duration, 900-100. The AMA landing option "d" will be used. The flight order will be called. FCC and AMA will be required.

Club patches are 60¢ and club decals are 50¢, see the treasurer Dick Hamilton at the meeting or out at the field.

October Contest

The October contest was run quite well by Bob and Tim Renaud. The tasks were FAI speed, distance, and duration. Don Edberg, a visitor from Torrey Pines turned in an exellent performance. He won the speed event with a time of 13.5 seconds and maxed in the distance event. Don was flying Lee Renaud's new design, the Sagitta. Tim Renaud who was also flying a Sagitta allmost turned an 11 second speed run. 30 feet from the finaish line, Tim's plane hit some turbulence and crashed. The plane sustained some damage to the right wing tip but was okay otherwise. Wayne Rowell did a fine job flying these tasks in his first club contest, he was flying a new Aquila.

1. Edberg	3940 -	1000	
2. Gerbin	3445 -	874	
3. Chasteler	3340 -	848	
4. Sheldrake	3269 -	830	
5. Harris	3238 -	822	
6. Monroe	3113 -	790	
7. Foster	2803 -	712	S
8. Nelson	2610 -	662	
9. Rowell	2587 -	657	S
10. Ritschke	2390 -	607	
11. Fink	2338 -	594	S
12. Costello	2244 -	570	S
13. Richardson	2150 -	546	S
14. White	1605 -	407	
15. Renaud, T.	0 -	0	

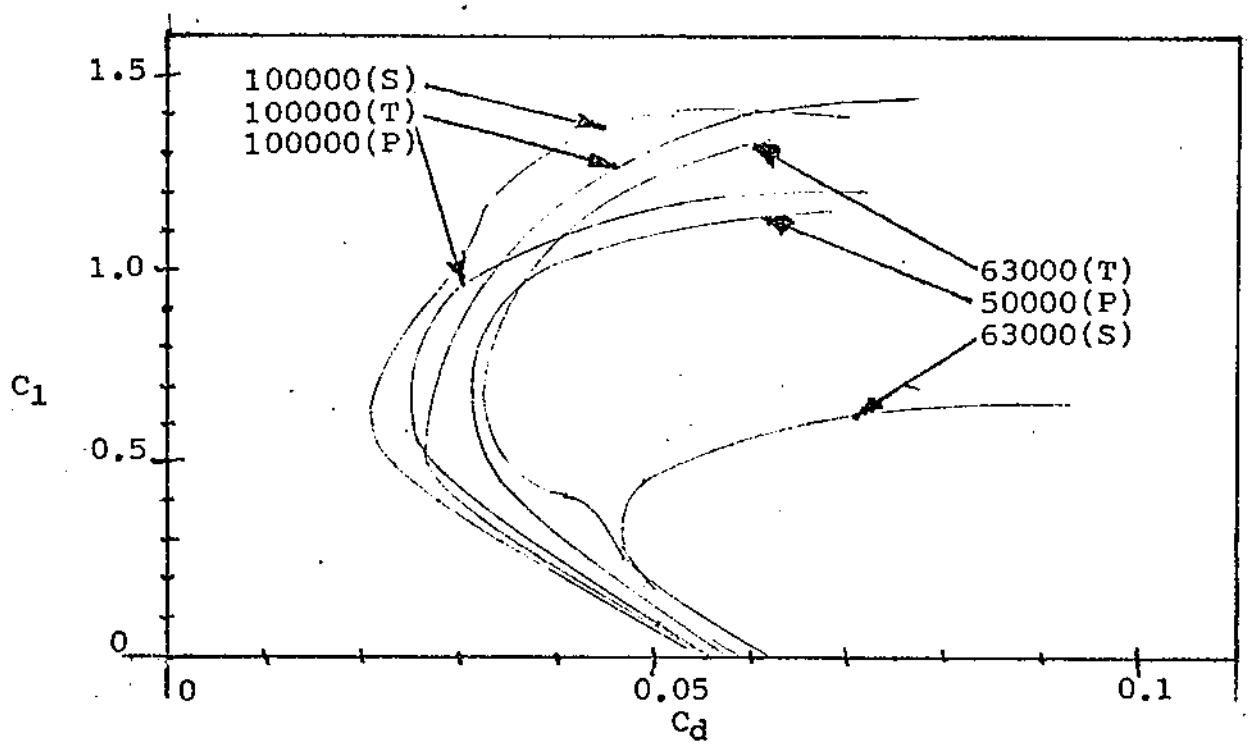
Overall Club Standings *

1. Gerbin	5706
2. Harris	5658
3. Foster	5463
4. Chasteler	5290
5. Nelson	5141
6. Ritschke	5084
7. Wiseman	4756
8. Richardson	4687
9. T. Renuad	3596
10. Fink	3454
11. Endicott	3139
12. White	3096
13. Costello	2673
14. Thacker	2662
15. B. Renaud	2494
16. D. Fryslie	1882
17. L. Lake	1812
18. Rizzardi	1713
19. K. Lake	1671
20. Russell	1132
21. Olhaver	1095
22. Muncey	916
23. Hanson	871
24. L. Renaud	726
25. Rowell	657

* 2 low scores dropped

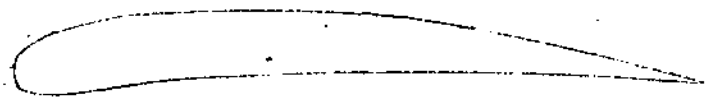
Turbulators and Roughness

by Pete Richardson



Göttingen 801
7% camber @ 35%
10% thickness @ 30%

(S)-smooth
(T)-turbulated
(P)-paper



Once in a while we get into a discusion with our fellow pilots about what to do with the first 30% of an airfoil. Should we use sheeting, turbulators spars, tape strips, or sand the monokote. Some tests carried out by K. Kraemer in 1961 should shed some light on the subject. Kraemer performed these tests on a popular modeling airfoil of those days, the Göttingen 801. The airfoil surface was prepared in three different ways, first was a plain smooth surface, second was the smooth surface with a turbulator wire out in front of the leading edge, and third was a tissue paper covered profile. Kraemer used a low turbulence wind tunnel so the Reynolds numbers on the plot are very close to the effective Reynolds numbers encountered by our sailplanes.

The results of these tests show some increases and some decreases

in performance. At a Reynolds number (Re) of 100000 the smooth profile has the best maximum lift to drag ratio (L/D_{max}) of 37.5. The turbulated profile had a 22% decrease in L/D_{max}, but about the same maximum lift coefficient (C_{lmax}). The paper covered profile had a 15% decrease in L/D_{max} and a 16% decrease in C_{lmax}. At a Re of 63000 the smooth profile had an L/D_{max} 73% less than the same profile at 100000. The turbulated profile had a 157% increase in L/D_{max} and a 108% increase in C_{lmax} over the smooth profile at a Re of 63000. The paper covered profile at a Re of 50000 had a 160% increase in L/D_{max} and a 77% increase in C_{lmax}. These results show show that for the lower Re an increase in airfoil efficiency can be achieved by using turbulators or roughing up the airfoil surface. Over a certain Re the addition of turbulators and roughness decreases the efficiency of the airfoil. The Re where the modifications no longer increase the efficiency of the airfoil is called the critical Reynolds number (Re_{cr}). Below the Re_{cr} the boundary layer is laminar and laminar boundary layers tend to separate in adverse pressure gradients. Above the Re_{cr} the boundary layer is transitioning to turbulent flow and it is not as vunerable to adverse pressure gradients. The turbulators and roughness decrease the Re_{cr} and force transition to occur sooner. The Re_{cr} for the Göttingen 801 is between 63000 and 75000, the 75000 curve (not shown) is similar to the 100000 curve. The Re_{cr} for different airfoils usual goes up with increasing nose radius and with increasing thickness.

What can you do with this information? If the Re on your sailplane is below, say 80000, you can add turbulators to the wing and see what happens. When you check the Re of your plane, remember to take into account the different lengths of the tip chord and the root chord. Turbulators on the outer wing panel may help the tip-stall characteristics of your sailplane.

$$Re = 6380 \times L(ft) \times 29\sqrt{\frac{W(lbs)/S(ft^2)}{C_l}}$$

W-weight
S-wing area
L-wing chord