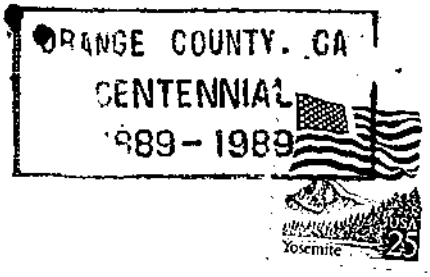
Harbor Soaring Society
P.O. Box 1673
Costa Mesa, CA 92626



FIRST CLASS MAIL

WILL CONRAD
9359 SHRIKE AVE
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(The Soaring) Society Column

President:	Chris Hurley	(714) 458-9251
Vice Pres:	Roger Lowery	(714) 756-9356
Secretary:	Jared Stalls	(714) 722-1846
Treasurer:	Frank Chastler	(714) 545-2185
Contest Coord:	George Joy	(714) 556-6385
General Dir:	Ross Thomas	(714) 638-0705
News Letter Ed:	Bob Sliff	(714) 895-1203

"The Oldest Sanctioned Soaring Club In the AMA"
Chapter # 128

July 1989 Volume 26 Number 7

July Club Meeting: The July club meeting will be held on Wednseday, July 5, 1989, 7:30 pm at the Consolidated Water District Office, 1965 Placentia Ave., Costa Mesa, Ca. The Monthly club contest will be on the 9th of July, field conditions permitting.

Roy Reineman will be speaking at this month's meeting. He is a Professional Model Builder/Exact Scale. He will be speaking on materials and techniques for quicker molds for glass parts.

August Club Meeting: The Aug. club meeting will be held on Wednesday, Aug. 9, 1989 at 7:30 pm at the Water District Office.

MINUTES OF THE JUNE 89 HSS MEETING

The meeting was called to order by Vice President Roger Lowery at 7:30 p.m.

1. The minutes of the May 1989 meeting were approved as published.
2. New Face: Jim Parsons and Ralph Chamberland were introduced to the club.
3. Old Business:

a) George Joy has received a letter from the Malibu Club. They have invited HSS members to their monthly contest on Aug. 13th. See George for further info.

b) Felix Vivas provided more info on the F3E Seven Cell Contest in August.

c) Will Conrad has purchased a set of plans of the Fairview Park for the club. Will has also resigned from his position as our club rep. with the city.

d) Felix Vivas motioned to make Will Conrad a lifetime member for all of his service in the club's interest. It was seconded and approved by the members present.

e) Ken Myers motioned that we move all winches at all times to the other side of the bike trail so as not to interfere with pedestrians and cyclists. It was seconded and passed by the members present.

f) Will Conrad would like to see someone take over the responsibilities for attaining our field permits and restroom rentals. He will show the next person where to go and who to see.

g) We will be having our 4th of July party on the 4th at George Joy's house at 1:00 p.m. after a fun fly. Please call Felix Vivas for what to bring.

4. New Business: None

Meeting closed at 8:30 p.m.

Jared Stalls
Secretary

HSS CONTEST DEPARTMENT

George Joy, Contest Coordinator

The following contest schedule is complete to the best of my knowledge.

DAY	MONTH ... CONTEST DIRECTOR OR INFORMATION
9	JUL ..... George Joy (HSS Monthly)
15-32	JUL ..... AMA Nationals
6	AUG John Lupperger (HSS Monthly)
19-20	AUG ..... Felix Vivas (7CELL F3E)
27	AUG TOSS SC2
10	SEP ..... Bob Sliff (HSS Monthly)
24	SEP ..... ISS/SWSA SC2
8	OCT ..... Dave Nemecek (HSS Monthly)
15	OCT ..... PSS SC2
5	NOV ..... _____(HSS Monthly)
19	NOV ..... George Joy/Frank Chastler (HSS SC2)
3	DEC ..... _____(HSS Monthly)

The above is a Partial Schedule--Will add more as they become known.
Please Note the blanks--I Need CD's for these.

The HSS Video Library//R. Lowery, Librarian

The following club owned videos are available for viewing.

NAME/COMMENT/RATING (0-5)
SABER JET / F-86 History/shoot-em-ups / 4
STRIKING BACK / 4
FOAM, FIBERGLAS, FLIGHT / 4
FIRST FLIGHT / 0
MONOKOTE 1 & 2 / Interesting / 3
MIG KILLERS / 3
HOOK DOWN, WHEELS DOWN / NAVY Avation Hist / 4
F3E USA Team Selection 1988Elect flight
DAWN PATROL / WWI Movie / 4
THUNDERBOLT, FLIGHT FOR THE SKYS
WWI Air Combat / 5

More Tapes are being added all the time. All tapes are in VHS format. If you would like to check a tape out or return one, call me, Roger Lowery, so we can meet at the field or at the club meeting or something. My number is 756-9356

CONTEST DEPARTMENT

Our club has been invited to participate in a contest to be hosted by the MALIBU R/C SOARING SOCIETY, on Sun. August 13th. This date does not conflict with our own contest schedule. On behalf of the club I have accepted the invitation. I would like to say that this club is fairly new. They started out as a slope soaring club and have expanded to thermal flying as well. I am a member of this club and can say that there are many very friendly folks in it. It has been a joy to watch and help them grow. I would like to encourage everyone to come to their field and have a good time. Their field is located on the mesa across Pacific Coast Hwy from Pepperdine University. Like our field, they have a slope at the end of the launch area. The landing area is a challenging one due to the slope of the terrain. All in all, it will be a lot of fun. If interested in going, please let me know so I can give them an estimate of how many to expect.

The contest for July will be CD'd by yours truly. It will consist of three rounds. Round 1 will be a 5 min. duration with 1 min. to land, scored 800/200; Round 2 will be a 7 min. man-on-man, scored 900/100; Round 3 will be a 3 min. precision duration, scored 500/500 (bell curve).

LSF LEVEL IV GOAL AND RETURN WITH THE NCC GUYS

On Saturday, June 17th Pete Richardson and I went to the Temecula area with the group from NCC to try for LSF Level 4 Goal and Return. We arrived at 9:40 am and Norm Tillman had just finished setting up the winch. There were 4 of us that were going to make the attempt Norm Tillman, Pete Richardson, George Joy and John Hunter. There was one other person, Jeff, along to help. I apologize because I forgot Jeff's last name.

The winch was set up with a down wind launch, but winds were very light. Norm took the first launch to see if there was any thermal activity. He searched for a couple of minutes but came up empty. As he turned on base leg of his landing approach he went through a bubble and circled in it. It broke loose and his Pantera climbed to altitude. We jumped into the pickup and started off. He made the turnaround with good altitude, turned and headed for home. All was looking very good at this time. About halfway back he found some sink. As he approached the launching area he was getting very low. Just as we reached the launch area he had about 3 feet of altitude left and set down while still in the truck and moving. First launch and first attempt a success.

CONGRATULATIONS NORM!!!

(1 down 3 to go)

Now it was my turn. I launched my New Cheetah searched the sky but came up empty (must have been the new bird).

Pete's turn. We got Pete into the back of the pickup and tied down his wheelchair for safety. Launched him with a scary turn to the left, but he straightened it out. He searched and found a little lift but not enough.

Now it was John's turn. He launched but still no lift.

Pete was still tied down in the back of the pickup, so we launched him again, this time his expertise got him up to altitude and off to the turn around they went. On the way back he was picking up speed so the driver accelerated, Pete's transmitted tumbled into his lap and forced down elevator. Help arrived quickly and got the transmitter back into its position and Pete was able to get control, but not until so much altitude was lost that he could not get back. Pete had to land short (darn).

As the truck arrived back in the launch area with this ridiculous story I launched again, but still no lift. (Got to be the new bird.)

I relaunched Pete and he did it again, got to altitude, but this time with the transmitter strapped down, headed out and got back with altitude to spare. Great job Pete. This completes your level IV. CONGRATULATIONS PETE!!!

(2 down 2 to go)

John launched again, but again no lift. I guess Pete and Norm used it all up.

Here I go again. This time with the old Cheetah, I know I can find lift with this one. I found some and started to climb (I knew it was the bird). Got a couple of hundred feet and it went away. How come? I know this bird will make it.

John made another attempt, but still no luck.

It was decided that since Pete had been tied up in the truck so long that it was time to get him out and into some shade, while that was being done I launched the new bird again. Searched the sky for about 2-1/2 min. with no luck. Turned in on final for landing and went through a bubble and turned back. Nursed it for a couple of min. and it broke. I had a lot of altitude now, but Pete wasn't finished getting out of the truck yet, so I kept flying. Lost that thermal and was losing altitude, as the truck was made ready I found another and skied out (maybe it wasn't the bird?). Jumped into the truck and headed out, I had been airborne for about 10 min. When I reached the turnaround I had plenty of altitude. Turned and headed home. Now we were going upwind so I put in a couple of clicks of down. The plane accelerated and we did too. We were doing about 38 mph but not catching the bird. Circled once to catch up. Arrived over the launch area about 17 min. into the flight with a couple of hundred feet left to spare. Slowed it down and landed safely. HOORAY I MADE IT!!! Now to get to those elusive hour flights.

(3 down 1 to go)

John launched again and found some lift, climbed out, got into the truck and off we go again. Got to the turnaround, was not very high, turned into the wind and started back. Needed some lift badly, found a little and climbed but not enough, found another but not much help. Got about 1/4 of the way back and had to land. Sorry John. Better luck next time.

I wish to thank the guys from NCC for asking us along. It was a great experience. THANKS AGAIN!

GEORGE

Harbor Soaring Society

June Monthly Contest Results
Open Division

	Name	Actual Score	Normal Score	Class	Trophy
1	HARRIS,P	2,971.0	1,000.0	E	E-1
2	MEIENBERG,K (G)	2,917.0	981.8	E	E-2
3	WHITE,L	2,903.0	977.1	A	E-3
4	RICHARDSON,P	2,871.0	966.3	E	
5	SANDRONI,H	2,861.0	963.0	S	A-1
6	FINK,D (G)	2,859.0	962.3	E	
7	SLIFF,B	2,846.0	957.9	E	
8	GARNER,R	2,796.0	941.1	E	
9	RITSCHKE,G	2,734.0	920.2	E	
10	SMITH,M	2,729.0	918.5	E	
11	CHASTELER,F	2,699.0	908.4	E	
12	MARTIN,T	2,665.0	897.0	E	
13	BELL,S	2,658.0	894.6	S	A-2
14	HURLEY,C	2,635.0	886.9	E	
15	LOWERY,R	2,607.0	877.5	A	
16	STALLS,J	2,586.0	870.4	A	
17	NEMECEK,D	2,567.0	864.0	A	
18	JOY,G	2,544.0	856.3	E	
19	PANTZAR,D	2,460.0	828.0	E	
20	KUTCH,N	2,414.0	812.5	A	
21	CRON,A	2,359.0	794.0	A	
22	DANRICH,D	2,109.0	709.9	S	S-1
23	CONRAD,W	1,292.0	434.9	A	
24	THOMAS,R	668.0	224.8	E	

June Monthly Contest Results
2 Meter Division

	Name	Actual Score	Normal Score
1	STALLS,J	2,901.0	1,000.0
2	JOY,G	2,879.0	992.4
3	WHITE,L	2,743.0	945.5
4	HURLEY,C	2,567.0	884.9
5	HALL,H	2,488.0	857.6
6	THOMAS,R	2,482.0	855.6
7	SLIFF,B	2,465.0	849.7
8	BELL,S	2,311.0	796.6
9	KUTCH,N	2,268.0	781.8
10	CRON,A	2,121.0	731.1
11	FINK,D	2,044.0	704.6
12	CONRAD,W	1,569.0	540.8

Yearly Standings - Open Division
Through June

	Name	Score	Contests	Avg
1	GARNER,R	5,813.5	6	968.9
2	CHASTELER,F	5,765.6	6	960.9
3	MARTIN,T	5,674.0	6	945.7
4	WHITE,L	5,599.6	6	933.3
5	SLIFF,B	5,510.8	6	918.5
6	LOWERY,R	5,428.4	6	904.7
7	HURLEY,C	5,388.4	6	898.1
8	RITSCHKE,G	5,290.5	6	881.8
9	PANTZAR,D	5,227.3	6	871.2
10	HARRIS,P	4,971.7	5	994.3
11	RICHARDSON,P	4,703.1	5	940.6
12	CONRAD,W	4,657.7	6	776.3
13	STALLS,J	4,489.3	5	897.9
14	THOMAS,R	4,410.3	6	735.1
15	NEMECEK,D	4,266.1	5	853.2
16	HENDRY,S	4,139.9	5	828.0
17	CRON,A	4,012.5	5	802.5
18	STOVALL,W	3,915.0	5	783.0
19	JOY,G	3,579.0	4	894.8
20	POULSEN,G	3,552.6	4	888.2
21	BELL,S	3,360.0	4	840.0
22	LAMPRECHT,D	2,846.4	3	948.8
23	SANDRONI,H	2,720.5	3	906.8
24	DANRICH,D	2,606.5	3	868.8
25	RANDOLPH,W	2,526.4	3	842.1
26	FINK,S	2,510.7	3	836.9
27	KUTCH,N	2,327.5	3	775.8
28	FINK,D	1,946.3	2	973.2
29	LUPPERGER,J	1,900.8	2	950.4
30	SMITH,M	1,856.1	2	928.1
31	ZINK,D	1,611.1	2	805.6
32	CHASTELER,T	1,537.4	2	768.7
33	MEIENBERG,K	981.8	1	981.8
34	ENGER,L	951.2	1	951.2
35	DEE,M	943.8	1	943.8
36	HALL,H	909.5	1	909.5
37	OLSEN,H	850.4	1	850.4
38	LEE,T	818.6	1	818.6
39	QUISENBERRY,J	689.2	1	689.2
40	EGOLF,D	686.8	1	686.8
41	WEBSTER,D	599.2	1	599.2
42	WENTWORTH,C	552.4	1	552.4

Yearly Standings - 2 Meter Division
Through June

	Name	Score	Contests	Avg
1	WHITE,L	5,650.5	6	941.8
2	SLIFF,B	5,523.5	6	920.6
3	HURLEY,C	5,445.5	6	907.6
4	THOMAS,R	5,402.0	6	900.3
5	CONRAD,W	5,138.8	6	856.5
6	POULSEN,G	3,585.3	4	896.3
7	JOY,G	3,540.8	4	885.2
8	HALL,H	3,503.5	4	875.9
9	BELL,S	3,412.9	4	853.2
10	STALLS,J	3,000.0	3	1,000.0
11	LAMPRECHT,D	2,870.7	3	956.9
12	KUTCH,N	2,170.4	3	723.5
13	LUPPERGER,J	1,809.9	2	905.0
14	LOWERY,R	1,672.3	2	836.2
15	FINK,S	1,487.1	2	743.6
16	CRON,A	1,270.2	2	635.1
17	QUISENBERRY,J	868.7	1	868.7
18	ZINK,D	814.1	1	814.1
19	FINK,D	704.6	1	704.6

SOUTHERN CALIFORNIA SOARING CLUBS
RESULTS OF SULA (SC2) CONTEST OF 06/25/89
CONTEST DIRECTOR - STEVE ADDIS

	NAME	CLUB	CLASS	SCORE	NORMAL	TROPHY
1	GRISWOLD,CHUCK	TOSS	EXPERT	1988.0	1000.0	E-1
2	PUCHALSKI,MARK	SULA	SPORTSMAN	1976.0	994.0	E-2
3	FINK,DAN	SULA	EXPERT	1969.0	990.4	E-3
4	STALLS,JARED	HSS	SPORTSMAN	1966.0	988.9	E-4
5	MEINENBERG,KEN	SULA	EXPERT	1964.0	987.9	E-5
6	MARTIN,TONY	HSS	EXPERT	1963.0	987.4	
7	SANDRONI,HUGO	SULA	SPORTSMAN	1958.0	984.9	S-1
8	SLIFF,BOB	HSS	EXPERT	1934.0	972.8	
9	WURTS,JOE	TOSS	EXPERT	1929.0	970.3	
10	LUEKEN,JIM	NCC	EXPERT	1921.0	966.3	
11	HARRIS,PHIL	HSS	EXPERT	1902.0	956.7	
12	BONANNO,TONY	SULA	SPORTSMAN	1874.0	942.7	S-2
13	RAYMOND,KEN	NCC	EXPERT	1868.0	939.6	
14	McNAMEE,ART	TOSS	SPORTSMAN	1867.0	939.1	S-3
15	MORAN,MYLES	TOSS	EXPERT	1855.0	933.1	
16	HENDRICKSON,ERIC	TOSS	EXPERT	1850.0	930.6	
17	SPENCER,RANDY	SULA	EXPERT	1802.0	906.4	
18	RICHARDSON,PETE	HSS	EXPERT	1773.0	891.9	
19	GARNER,RICH	HSS	EXPERT	1751.0	880.8	
20	FEDELLECK,JERRY	SULA	EXPERT	1735.0	872.7	
21	DANRICH,DAN	HSS	SPORTSMAN	1723.0	866.7	
22	DOUGLAS,IAN	ISS	EXPERT	1713.0	861.7	
23	THOMAS,ROSS	HSS	EXPERT	1700.0	855.1	
23	BITZBERGER,JOHN	SWSA	SPORTSMAN	1700.0	855.1	
25	ADDIS,STEVE	SULA	EXPERT	1693.0	851.6	
26	JENKINS,HARVEY	ISS	SPORTSMAN	1689.0	849.6	
26	WEISMAN,EDGAR	TOSS	SPORTSMAN	1689.0	849.6	
28	SHELBY,RICH	SWSA	SPORTSMAN	1677.0	843.6	
29	CRON,AL	HSS	EXPERT	1621.0	815.4	
29	McGUIRE,JUSTIN	SWSA	SPORTSMAN	1621.0	815.4	
31	FINK,STEVEN	HSS	SPORTSMAN	1610.0	809.9	
32	SIREN,JAY	PSS	EXPERT	1609.0	809.4	
33	TILLMAN,NORM	NCC	EXPERT	1556.0	782.7	
33	SMITH,JIM	PSS	EXPERT	1556.0	782.7	
35	ZINK,DON	HSS	SPORTSMAN	1546.0	777.7	
36	JOY,GEORGE	HSS	EXPERT	1522.0	765.6	
37	RODIGOEZ,JOE	ISS	SPORTSMAN	1517.0	763.1	
38	STEVENS,JIM	SULA	EXPERT	1502.0	755.5	
39	ATWELL,BLAIR	SULA	SPORTSMAN	1496.0	752.5	
40	STAFFORD,IRV	NCC	EXPERT	1489.0	749.0	
41	SHORT,HOWARD	SULA	EXPERT	1467.0	737.9	
42	AKER,IRV	SULA	EXPERT	1424.0	716.3	
43	VICKERS,DON	SULA	EXPERT	1398.0	703.2	
44	STOWERS,ROY	SULA	EXPERT	1353.0	680.6	
45	HOLLEY,MARY	SWSA	SPORTSMAN	1274.0	640.8	
46	OLSEN,ROBIN	SWSA	SPORTSMAN	1268.0	637.8	
47	DOIG,AL	NCC	EXPERT	1230.0	618.7	
47	BATES,JEFF	NCC	SPORTSMAN	1230.0	618.7	
49	CONRAD,WILL	HSS	SPORTSMAN	1122.0	564.4	
50	LONG,DICK	SULA	SPORTSMAN	1085.0	545.8	
51	OLSEN,PETE	SWSA	SPORTSMAN	939.0	472.3	
52	JONES,DAVE	SULA	SPORTSMAN	790.0	397.4	
53	KELLER,JAMES	SWSA	SPORTSMAN	577.0	290.2	

SOUTHERN CALIFORNIA SOARING CLUBS
RESULTS OF SULA (SC2) CONTEST OF 06/25/89
TEAM SCORES

SULA 16	HSS 13	TOSS 6	NCC 6	SWSA 7	ISS 3	PSS 2
994.0	988.9	1000.0	966.3	855.1	861.7	809.4
990.4	987.4	970.3	939.6	843.6	849.6	782.7
987.9	972.8	939.1	782.7	815.4	763.1	
984.9	956.7	933.1	749.0	640.8		
3957.2	3905.8	3842.5	3437.6	3154.9	2474.4	1592.1

TIDEWATER MODEL SOARING SOCIETY
TECHNICAL JOURNAL #18
EXTRACTED FROM SOAR TECH IV, JAN. 85

RUDDER AND FIN DESIGN

The following ideas are based on years of observation of various RC sailplane rudder arrangements and their effects on the handling and performance of the models. In putting together the first "Soar Tech" journal, I have also had an opportunity to look through a number of old NACA reports in which control surface arrangements were studied and tested for both effectiveness and efficiency. Put together, these have made me look critically at the fin and rudder designs of my own plans and others and I've decided that I generally don't like what I see.

In almost every respect, a fin and rudder combination works just like a wing with a flap, or an aileron. The features of a wing/aileron combination that make it efficient and effective apply with some specific exceptions to the design of a good fin/rudder. The first point has to do with those rudder balance areas which are a style on so many of the designs in use today. There is seldom a good reason for this kind of rudder design on an RC sailplane design. It is very inefficient because when you want the fin/rudder to develop lift (read that yaw the model), it has the effect of wash-in which causes a lot of unnecessary drag. This kind of balance was used in full size aircraft to get the right forces in the control system for proper pilot feel. For aerodynamic efficiency, however, they are usually very undesirable on a control surface that gets used much by the pilot.

The second design feature that needs a critical look is the rudder chord. The old NACA data I mentioned has reports which show that when the chord of the control surface (rudder) gets larger than about 35-40% of the chord of the whole surface it produces more drag without a corresponding increase in effectiveness. The basic gem of knowledge here is that the span of a control surface is more important than its chord. If you look around you'll see that most of our designs have gone the other way.

Where, you ask, does this kind of thinking send us, and what are the new problems to be avoided there? First, it should influence us to use higher spans rather than greater chords to get the amount of control and stability we want from the fin/rudder design. Be careful, though, because high aspect ratio surfaces stall at lower angles of attack (yaw) than low aspect ratio surfaces. It's best to avoid designs where the A/R of the fin/rudder combination is larger than 2.5 to 3. A/R equals span or height divided by the average chord (or span squared divided by area). Then, use a smaller rudder chord than what you're used to seeing. I think that the 35-40% figure is right. Next, go for a bit of washout, rather than the wash-in that comes from using horn balance area. Do this by stopping the rudder short of the fin tip. This method has been used on aileron design for quite a while. Another method is to reduce the percentage chord of the rudder as it approaches the tip. Thus, it might be 40% chord at the fuselage and only 25% at the tip.

There are some real inefficiencies induced at the lower end of the rudder when we have a large chord rudder extending all the way to the bottom of the fuselage. Here the effect of the small design refinements will not make so much difference because the area is already inefficient due to the airflow irregularities in the wake of the fuselage and the wing root. Still, if you want to go all the way, the most efficient arrangement (from the viewpoint of minimizing maneuvering drag) would be to stop the rudder at the top of the fuselage.

A well designed t-tail arrangement will also improve rudder efficiency. To get the benefit of this, however, the rudder top must be fitted closely to a non-moving stabilizer surface. Thus, the elevator would have to be located behind the rudder. Not an easy arrangement to build. This design increases the effective aspect ratio of the fin/rudder and, if you use it, you should probably limit the A/R to the range of 2.5 or less.

How about the idea of an all-moving vertical tail? Not a bad idea, but not so easy to build with good control and stiffness. Remember too that an all-moving surface cannot develop as much lift (yaw) as a conventional fin and rudder design. (Just as a wing without a flap can't develop as much lift as a wing with a flap.) If you were successful in putting together a good structural and control arrangement, a true all-moving design would have the least drag (for small control deflections).

Don't forget it's for fun--Herk

HSS JUNE 89 ROSTER

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The Harbor Soaring Society

INDEPENDENCE DAY

1989 summer club picnic

Date: July 4th

Time: 1:P.M.

Place: Home of George Joy

2706 Pendelton St.

Santa Ana, Ca 92704

(714) 556-6385

Coordinated by Felix Vivas. (714)645-3263

Please contact Felix for Items to bring.

TIDEWATER MODEL SOARING SOCIETY
TECHNICAL JOURNAL #16
EXTRACTED FROM SOAR TECH IV, JAN 85

MOUNTING DESIGNS FOR ALL-MOVING HORIZONTAL STABILIZERS

All-moving horizontal stabilizer mounting and control doesn't usually cause much trouble on thermal-soaring model designs. Poke a couple of wires through a horn in the fuselage, mount the stab halves on the wires in some reasonably convenient way, and "presto" you have an effective pitch control that will require very little additional attention. Multi-task model design (FAI/F3B, 2-METER WORLD CUP, ETC.), however, creates a need for planes that can routinely fly at much higher speeds. This kind requires more careful consideration of the details of the design.

There are two basic problems that need attention when you are laying out this kind of plug-in stab arrangement. The first is the location of the pivot point on the chord of the stab. Here it is important to minimize the effects of the airload on the stab in relation to the linkage and the servo. By mounting the pivot point at just the right spot, you can practically eliminate any loads on the servo and push-rod. This is true regardless of how large the stab is or how high the airspeed, and is very important to smooth the control of the model. If the pivot point is too far forward on the stab the high airloads can overpower the linkage and servo, thus driving the stab toward neutral and making it difficult to make tight turns, or pull out of high speed dives. On the other hand, if the pivot point is too far aft on the stab airloads it can make the stab deflect further than the pilot intended. Deflections can, in fact, occur even when the pilot hasn't put in any control motions. Planes with this kind of problem get very funny (or not funny) to fly high speed. The solution for this part of the design problem is to mount the pivot rod with its alignment as near as possible to the 1/4 chord point on the mean chord of the stab. Of course, if you're into aerodynamics, you know that the mean aerodynamic chord isn't that simple to locate--but for simplicity, if you lay out the stab half on paper, act as if the rudder cutout is part of the stab, amputate whatever kind of tip you've put on it and find the average chord location for the remainder. That will be close enough for sub-sonic sailplanes.

The second design factor has an effect which is not quite as easy to see. This time we're dealing with the problem of aeroelasticity and we find the ideal design arrangement sandwiched between flutter on the one hand, and divergence on the other. Mounting the stab with only one rod at the 1/4 point of the mean aerodynamic chord (MAC) is not the usual design. We ordinarily put another rod either forward or aft of the pivot rod to tie the stab solidly to the actuating horn, which controls the movement of the stab. For clarity, I'll call this the actuating rod. (I'm already calling the other one the pivot rod.) The problem develops because once the stab is installed on the rods, it doesn't know which of the two is the pivot rod. (Stabs are dumb.) The stab sees these two rods as working together equally, and the aeroelastic axis for twisting and flexing is basically the average of the two wires. What all of this means is if you have the pivot rod at the 1/4 chord of the M.A.C. (25% MAC) and you install the actuating rod forward of the pivot rod, the elastic axis of this connection is halfway between the wires. This is easily seen to be well forward of the 25% MAC point. So what!--right? Well, if the wires are stiff enough, the stab small enough, and the speed low enough--it's no problem. But having this elastic axis ahead of the 25% MAC is a set-up for flutter. It's not within the scope of this paper to explain why this leads to flutter, but if you want to you can take my word for it. The other arrangement, with the actuating rod behind the pivot rod moves the elastic axis behind the 25% MAC, is much more desirable because this kind of arrangement tends to prevent flutter. It can (technically) lead to a high-speed condition known as divergence where the stab twists off, but this is very much less likely than flutter on a reasonably well designed model.

What is the best arrangement? Keep in mind that the pivot rod should be at the 25% MAC point for smooth controllability at high speed. My suggestion is that you make this rod larger in diameter than ordinary design practice. Install the actuating rod behind the pivot rod and make it somewhat smaller in diameter. (About the size used ordinarily for both wires.) This biases the elastic axis closer to the pivot rod, and still keeps it behind the 1/4 chord point to suppress flutter. Will this prevent stab flutter? In a word--NO! (Not by itself)--the bending and twisting stiffness of the stab itself (not just the connection to the horn) controls flutter too, and that is a different subject. I've also seen stab flutter caused by a very flexible fuselage on a pod-and-boom design. Nothing you do to the stab can do much to prevent that.