

FLIGHT LINE

THE PUBLICATION OF THE WINGS OF ROGALLO
 NORTHERN CALIFORNIA HANG GLIDER ASSOCIATION
 VOLUME 102, NUMBER 10 OCTOBER 2002



Entries for the Logo Competition -- Check the W O R WWW Site!

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The Editor's Turn

Will this issue of the *FLIGHT LINE* make it out on time? Life is full of mysteries! If it does, you should thank your dedicated Executive Committee, who stepped in at the last minute to help out with the printing and mailing. If it doesn't... you should blame your lowly editor.

The **WOR** Women's Fly-In and Club Picnic was a great success. This was all the more amazing because we had terrible conditions with high pressure and NE winds over the back. We've had a lot of those this summer. But Carm and Kathy ran a great event and a good time was had by all.

There are still a few more weeks left to run in the *WOR Logo Contest*. This is not a small matter! This is our legacy for the future! Eons from now, archaeologists will discover these logos and use them to reconstruct a picture of human civilization during the early decades of the 21st century, so be sure to make your views known.

On a more somber note, we hear that our own Jody Lucas was badly injured while flying in the Owens last month. Jody has introduced many new pilots to paragliding (I even took some lessons from him myself) and been a big part of our club for many years. I have no current or reliable details about how he's doing, but I hope you'll all join me in hoping for the best.

Women's Fly-In & Club Picnic

by Carmela Moreno

Just want to say *thanks* to all who showed up on a not so flyable day. *Especially big thanks* for those who stepped in and helped with the cooking and cleaning. Too many to name but you know who you are. Thanks again!

We collected close to \$300 for the Women's World team. Weather did not cooperate for the tandems flights. Some did fly by launching over the back and launching off the 600ft. There was plenty of new faces, plenty of food, not enough beer, and a friendly game of horseshoes. Oh yeah, the weather was nice too.

Looking forward to doing it again! Its a great way to meet the other half and hopefully next time we all fly! A special thanks should also go to Kathy for getting the ball rolling.

See ya on the hill!
Carmela

The WOR Logo Contest

by Steve Rodrigues

You will find all of the entry's for the **WOR** logo contest in this issue. You can see the color versions at

<<http://www.flywor.org/logo/>>http://www.flywor.org/logo/

Your opinion is important to the club, so we are postponing the final selection process until the November **WOR** meeting. Please come and make your vote count!

Mission Ridge Site Report, October 2002

by Steve Rodrigues

Keyholder Suspended!

A Mission Keyholder received a 30 day suspension for not adequately checking for helmet stickers. All keyholders have been reminded of this issue, so pilots requesting a ride up the hill should volunteer to show their helmet

sticker. Carmella has agreed to put a special Mission Ridge stamp on next years WOR cards to make checking easier. Thanks Carm! It is also very hard to follow up on things if we can't read your info, so please pay special attention to signing the log book clearly. Those who do not are also eligible for suspension.

The good news...

The gate at Mission launch may now be left open, and both the gate and fencing are due to be removed in the very near future! I hope to provide a work party to help the EBRPD achieve this. Many thanks to Dan Reasor for all his effort on our behalf. He really listens to our needs, and goes out of his way to help us out. For those of you who don't know, Mr. Reasor is the supervisor for the Sunol Ohlone, Mission Peak Regional Preserve. He has been a great supporter of hang and paragliding, and is always a pleasure to work with. Thanks Dan!

September 2002 Meeting Minutes *by Paul Clayton*

NEW MEMBERS/GUESTS

Novim Spencer - flies a Falcon

GREAT FLIGHTS / GOLDEN EAGLES

Pat Denevan - Flew Yosemite; greeted the rock climbers on El Capitan.

Art Thompson - Flew Point of the Mountain, Steamboat Springs, got to 14000'.

Mike Vorhis - Flew 90 miles from McClellan on his new Stalker.

Wayne Michelson - Flew the Owens on Labor Day; went past Janie's for 104 miles.

Eric Heinrichs - Flew a 35 mile loop at Indian Valley on Labor Day.

Eric Froelich - Flew Tollhouse; flew 29 miles from St. John to Bear Valley.

Lance King - Flew off the 600' launch for the first time.

George Morford - Flew past Ed Levin and was retrieved by the rangers.

Carmela Moreno - Flew Huff, and watched Steve Inwards scatter Bradley Ream's ashes over a nearby lake.

PRESIDENT'S REPORT - Steve Rodrigues

A vote on the new club logo is planned for the October meeting.

VICE PRESIDENT'S REPORT - George Morford

Nothing to report.

TREASURER'S REPORT - None

MEMBERSHIP COMMITTEE - Carmela Moreno

We now have 500 paid members for 2002.

FLIGHT DIRECTOR'S REPORT - Mike Vorhis

There was an incident at Ed Levin in which a pilot tripped on landing. There was also an incident in which a pilot taking a demo flight oscillated on landing approach and crashed, suffering significant injuries. There may be a newsletter article giving guidelines on flying a new glider for the first time.

ED LEVIN SITE COMMITTEE REPORT - Steve Pittman

The proposed dog park will probably be placed in the group picnic area. There will be a meeting of the Parks Commission to decide on the site. There is still a possibility of building a parking lot in the LZ, and construction of a glider storage area is also still under discussion. Checks of

pilot's proficiency stickers will continue. Tire tracks were noted coming across the field to the breakdown area.

MISSION PEAK SITE COMMITTEE REPORT - Steve Rodrigues

A keyholder who transported a pilot who did not have a sticker has been suspended for 30 days. A paraglider pilot recently launched into a dust devil and landed in a tree.

MT. DIABLO SITE COMMITTEE REPORT - None

SITE ACQUISITION - Jim Woodward

A meeting with a park ranger at Coyote lake is planned, for the purpose of trying the proposed launch site.

COMPETITION COMMITTEE - Mike Vorhis

A Board of Directors meeting will be held in October. Contact Mike with ideas for competitions.

OLD BUSINESS

None

NEW BUSINESS

Eric Froelich reported that Sonoma Wings has been purchasing streamers for use as wind indicators during cross country flights. A vote was taken and \$83 was allocated to buy a box for use by club members.

Eric Heinrichs reported that a public meeting will be held in November to discuss the uses of a new park at Mt. Umunum, possibly including flying.

Pat Denevan reported that Felix Roehl, designer of the ATOS and other rigid wings, will be guest speaker at the next meeting. Felix will be running ATOS clin-

ics while he is in town.

Entertainment was Mark Mullholland's slides from the world meet.

END OF MEETING MINUTES

Big Dan the Mission Man



Big Dan the Mission Man
if he can't do it nobody can!
From the mountains to the sea
he's way better than you and me

Watch him catch that next big thermal
he won't even give you a kernel
Just try and match his elevation
guaranteed to cause frustration

Wow can that big guy really boast!
he may even buzz the goat
From the Slide to the Roost
he don't need no stirkin' boost!

So all you bags think you can soar?
he'll make you look like a big fat boar
Baggie pilots, bring it on
he'll hop that lift and be long gone

Big Dan flies like an eagle;
truth be known, they're ain't no equal
All other pilots tremble and shake
just to avoid his mighty wake

Yea he may be gettin' a little old
but have you ever seen a pilot so darn bold?
Some have come to question his powers;
maybe it has to do with the towers

So you say you can fly?
you won't get half as high
If you see that red Ford Explorer
give it up - it's all over...

— anonymous

Pilot-Induced Oscillations:

A Simplistic Primer on Out-of-Control Hang Gliding
by Mike Vorhis

You hear it a lot in casual conversation: "This glider will PIO," or "That glider had a bad PIO problem." Conveniently absent in such statements is most of the blame's rightful ownership. The truth is that any glider will oscillate, given the right pilot and the right conditions. The acronym "PIO" expands to "Pilot-Induced Oscillation" for a reason. Without the pilot contributing to the problem, the problem should go away.

Instability

Balance a long 2x4 on its squared-off end. It stands motionless. But if your pet parrot bumps it, adding some sideways "error" to its stable position, that error increases due to constant natural forces (gravity) and the lumber topples.

This is an example of an inherently "unstable" system, because any error will naturally increase if nothing is done to stop it. An example of an inherently "stable"

system would be the same 2x4 suspended from the chandelier by a piece of string through one end. It still exhibits a motionless vertical posture, like the balanced version, but in this case anything nudging it will cause it to swing, with the sideways error DECREASING on each cycle, until it hangs motionless exactly where it was.

Figure 1 illustrates inherent instability and inherent stability.

The unstable system we described above was a one-shot deal-the 2x4 would be bumped, would fall, and that would be the end of the test. But there are cyclic unstable systems, wherein the error increases with each successive cycle, until eventually the system reaches failure. If the 2x4 were to be nudged slightly, and then totter back and forth a dozen times with each lean getting larger than the last, then we could talk about the cyclic nature of the instability. We'd call it an "oscillation." Eventually it would go out of control, but not before some number of larger and larger "cycles."

There are amplified oscillations, wherein the error gets greater every cycle. There are sustained oscillations, which get no worse

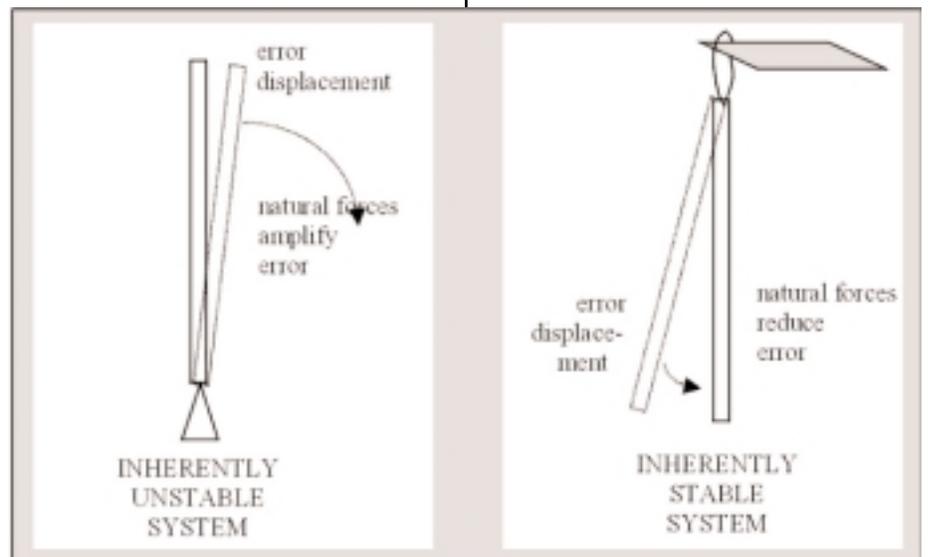


Figure 1: Inherent Instability vs. Inherent Stability

but get no better. There are damped oscillations, which get better each cycle until stability is again achieved.

Figure 2 shows a few examples of cyclic errors (oscillations).

Stability

In the case of a hang glider, there are three axes of angular motion a designer considers, not surprisingly identical to the three axes of control we have: pitch, roll, and yaw. Oscillations in any of these axes can initiate with the right input. Achieving stability (so that errors are naturally damped rather than amplified) in each of these axes is the responsibility of the designer and pilot both.

If errors are diminished because there is too much inherent resistance for them to continue, then the oscillation is said to be passively stabilized or passively damped. The designed-in stability features of a glider accomplish this kind of damping.

If errors are diminished by applying an overt force opposing them (such as is done with active noise cancellation systems or when a pilot resists a one-side thermal by applying roll into the rising wing), then the oscillation is said to be actively stabilized or actively damped. This technique, in essence, measures the error and injects it back into the system with the opposite magnitude, so that a positive error combined with the equal and opposite injected error will in theory cancel each other out. The pilot's own error correction input "fed back" into the glider would accomplish this kind of damping. (The "feedback" of inverted error into the system has to be fast enough, or it can actually apply to the next oscillation cycle, and add rather than subtract from the oscillation).

Coupling of Axes

No, this is not the stuff of voyeurs. Very often, oscillations in one axis are coupled to oscillations in another, following gyro-

scopic rules of physics. For example, yaw is commonly coupled with roll in oscillation problems. Pitch and roll can also be coupled, making an input in one axis induce a response in the other. Pitch and yaw are less often felt to be connected, probably because the coupling is highly damped.

Resonant Frequency of a System

A system, such as a glider with a 200lb pilot hanging from it, will be able to oscillate in some axis most readily at only certain frequencies. A roll oscillation that occurs with a left-then-right cycle every 1.5 seconds may not be able to sustain itself every 1.0 second; the shape of the glider, density of the air, and weight of the pilot and wings may make it too difficult to continue at 1-second intervals. Every system has frequencies at which it will more easily "resonate" or oscillate with sustained regularity. These are known as the "resonant frequencies" of the system.

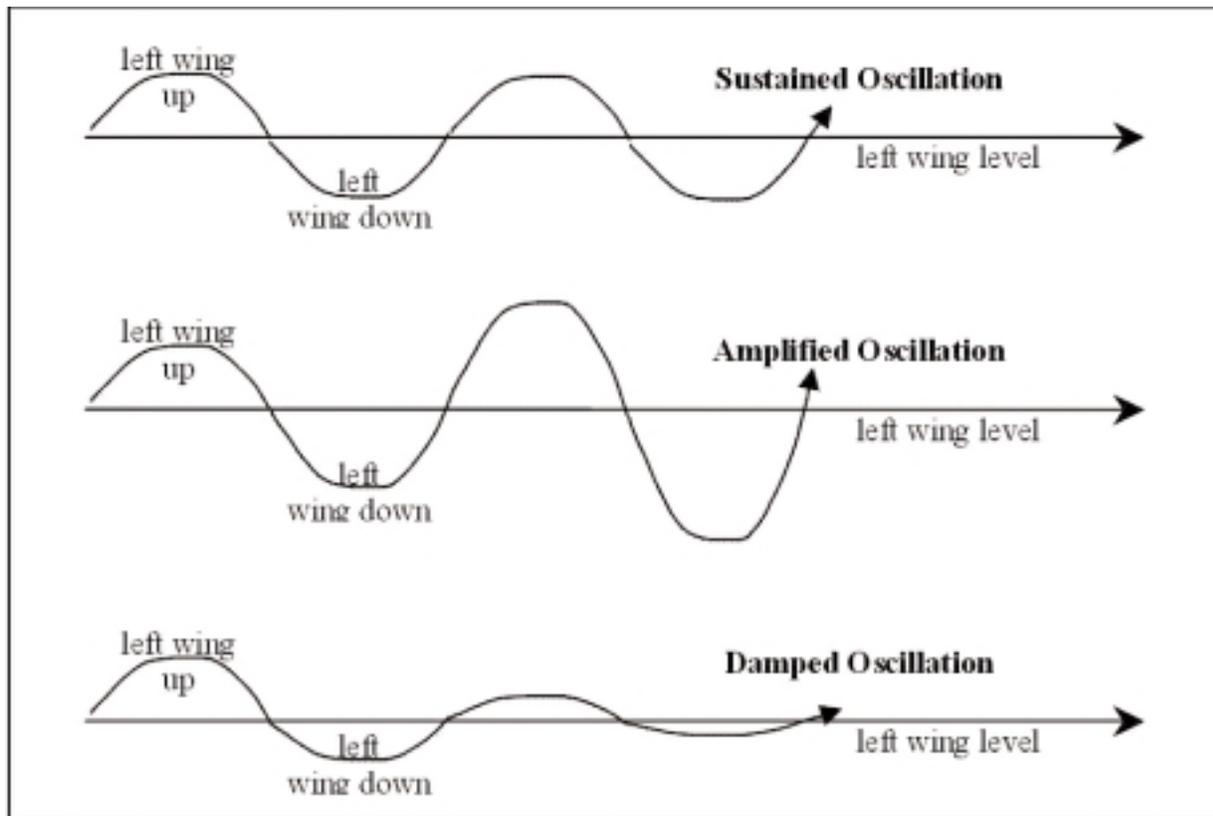


Figure 2: Types of Oscillation

Stabilization for systems whose precise operating conditions are known can be designed to focus on the resonant frequencies of that system. For a glider, the pilot size and air conditions throughout its life will vary quite a lot, so designers build in stabilization designed to be effective across a wide range of frequencies. Still, for any pilot, there are system resonant frequencies that will crop up more often than others.

Some Types of Oscillation

Some natural pitch oscillations are called “fugoid oscillations” and result in low-frequency “porpoising” at certain speeds and wing loads with little or no pilot input. These oscillations are typically tuned out or designed out by the manufacturer. (Paragliders can experience a front-then-back penduluming related to fugoid oscillations.)

No-input (or turbulence-input-only) oscillations in the other two axes (such as yaw oscillation, commonly called “wing-walking” in some slang vernaculars) are also common, but again are typically damped to at least acceptable degrees by design.

As higher performance hang gliders feature an overall anhedral shape (when taken as a whole system), the roll axis is not passively damped in the normal flight attitudes, and not inherently stable in these attitudes, and errors in this axis must be actively corrected by pilot input. (Proof of this is easy to create: Launch a glider sans pilot off a high place, and watch how long it tracks in a straight line. Of course, beyond a certain bank angle, passive roll stability increases, which keeps us from being spirally unstable or doing barrel rolls inadvertently.)

We call oscillations “pilot-induced,” but in fact an oscillation can be initiated by any out-

side force, including thermals or gusts. If it is sustained past one or two cycles, however, then either the glider is dangerously out of spec, or the pilot is unwittingly keeping the oscillation going, which leads us to the third type we’ll describe: Oscillations that require pilot contribution to continue. This is the true Pilot-Induced (or more accurately Pilot-Sustained) Oscillation, or PIO.

To be completely accurate, any roll or pitch input is an “error of one cycle’s duration” initiated by the pilot. The goal of controllable design is to allow these control inputs but to render multiple-cycle oscillations difficult to sustain. Since providing light handling and high performance are also goals, the coexistence of oscillation damping and responsiveness can be a big challenge, so PIOs are typically quite possible in any responsive glider design. Whether a pilot will experience them depends on all applicable parameters of the system, including pilot weight, pilot reaction time, pilot applied strength, pilot arm length, glider shape, viscosity of the air, and other factors. Basically, it’s lurking out there for all of us.

Resonance with (Over-)Active Correction

In nature, there is no loss-less system. All resonances will die out, some quickly, some slowly, without some energy input applied. In the case of a canoe and paddler, that active energy input could be the paddler leaning away from the edge of the boat as it appears that edge will dip below the waterline; if the paddler leans too far (because fear level, response time, and muscle strength are all part of the “system”), the canoe reverses to dip the opposite gunwale toward the water. The paddler leans in similar style to avoid the new threat in turn, and the original threat repeats itself. We have a

tip-over “resonance” of the system, with the “system” including the paddler’s natural behavior. If the paddler’s reaction diminishes with each cycle, the canoe will probably right itself eventually; if the paddler’s reaction amplifies the error each cycle, sooner or later we’re going to hear a splash.

So too with boats that float on invisible fluid mediums such as air: if a pilot’s reaction to an error in any axis diminishes or ends, a glider designed to damp oscillations will return to normal flight. If the pilot’s attempts to correct error are inadvertently timed such that the error amplifies with each cycle, the oscillation will worsen dramatically until the glider is completely out of control.

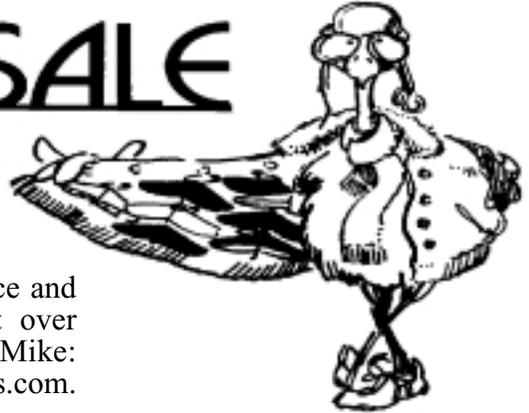
It should also be noted that at higher airspeeds, most gliders exhibit heightened responsiveness-response to inputs that is closer to the reaction speed of a human being, and this typically allows PIOs to amplify very quickly. Thus, faster flight will GREATLY increase the likelihood of oscillation, unless the pilot’s inputs are very accurately timed to avoid them.

To be continued...

*The sound of a plane
Within the fog overhead
I fly silently
Above the ocean
Sailing along the ridgetop
Soaring with a hawk*

-- by Eric Hinrich

WINGS FOR SALE



Wings for Sale

(Ad policy: ads are marked by date run for 6 months, then are cancelled automatically unless they are renewed. Ads are free to WOR members)

Rigid Wings

ATOS 146. 10 hours, like new, 73 lbs, comes with water proof bag, cam helper. Pictures and details at <http://home.pacbell.net/gpesaven/atos.html>. Contact Gerry, 530-219-1954, or gerrypez@yahoo.com (8/02)

Buran 98 m. Like new, only flown once. Great tandem speed gliding wing. Complete with wheels and unique ballistic launch system. Contact S. P. Korolev Rocket and Space Corporation Energia <http://www.energia.ru/> (10/2)

Flexwings

Aeros Stealth III Oleg Racer 151. The 2001 Speedgliding Nationals were won on this glider (which has since been tuned back to factory settings). Very low airtime. Carbon crossbar, carbon faired base-tube, carbon Horner type wing tips. You can *steal* this glider from me for \$2150. Contact Rick Cavallaro 650-961-5735 (6/02)

Airwave Klassic 155. for sale. Contact Eric Hinrich 831 335-4292 (10/02)

Altair Saturn 167. 1999, one owner, only 68 hours. The perfect intermediate glider White, red, & black; extras. \$2,100. Call Bernhard at (925) 820-9682 or BernhardBoeSter@CS.com (8/02)

Seedwings Topless Sensor 144. Very low hours, still crispy, mostly used for a couple of speed gliding

meets. Excellent performance and handling. Best offer I get over \$2400 takes it. Contact Mike: (510) 770-0544 mike@vorhis.com. (10/02)

Wills Wing Attack Duck 160. Red and blue. Own a piece of history! Challenge your landing skills! Only \$300! Contact Mark Mulholland (408) 929-1753 or email markmulhol@aol.com (5/02)

Wills Wing Eagle 164. 1 yr old, less than 28 hrs, like new because pilot switched to a K2. Contact Stan Boehm (408) 946-1328 (10/02)

Wills Wing Falcon 255. Orange, blue, white. Good condition, new wheels, extra parts for tandem. Includes ;large wheels and streamline downtybes. \$1200. Contact Gordon (415) 310-6602 (10/02)

Wills Wing HP AT 159. Custom colors. \$700. Contact Mark Mulholland (408) 929-1753 or email markmulhol@aol.com (5/02)

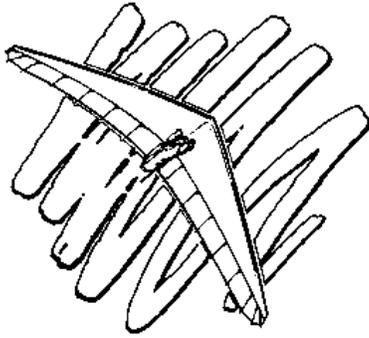
Paragliders

The drought of used paraglider ads continues. Very mysterious. Must be due to global warming.

Equipment

Finster Wheels: One complete set of Finster Wheels, with axles and corner brackets. Contact Paul Gazis at (408) 736-0764 or gazis@best.com.

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Rogallo*

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VOL. 101 NO. 10 OCTOBER 2002

The next Wings of Rogallo Meeting will be... or.. uh... was held
Tuesday, October 15.

at the Summit Point Golf Club in Milpitas near Ed Levin Park

Check the Wings of Rogallo WWW Page
<http://www.wingsofrogallo.org/meetings.html>
for details and directions.

Entertainment at the meeting... right... yes...
There will be Entertainment!