Radio Controlled Soaring Digest

November 2011 Vol. 28, No. 11

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Front cover: The busy winch line at the 38th Annual Fall Soaring Festival put on by Central Valley R/C at Visalia California. Photo taken at 11:42AM, 01 October by Bill Kuhlman. Konica Minolta 7D, ISO 100, f11, 1/500 sec., 160mm

Back cover: Flying against a gold sunset at Volksrust. Photo by Piet Rheeders. Nikon D90, ISO 200, 1/4000 sec., f7.1, 75mm

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In the Air

Another huge issue (108 pages) with contents (10 articles) covering a wide range of subject matter!

A collaborative effort on the part of several enthusiasts resulted in a comprehensive article on the effects of the new rules for the FAI- F5J event based on the Spanish National Championships which were held in Seville in October.

Two technical articles are featured herein. Ferdi Galè, an aeromodeller since 1934, is the author of "Lift on the Wing," and Marc Pujol gives food for thought in his well detailed treatise on yaw stability.

Piet Rheeders and Kevin Farr share exceptional photos of two slope soaring events in South Africa and Vincenzo Pedrielli covers an Italian aerotow gathering which disallowed ARFs.

Gordy Stahl describes his modifications to a Bob Sealy Constellation he picked up from Lee Murray a few years back, and Ed Anderson describes why he likes flying in the Eastern Soaring League (ESL).

The November issue would not be complete without photos from the Fall Soaring Festival in Visalia. 2011 marked the 38th year of this event, and a very large amount of appreciation is due the Central Valley R/C club for continuing to provide RC soaring enthusiasts with such a great venue. True landing circles were featured this year, and flight times were 5-10-10-10 on Saturday and 5-10-10 on Sunday. The proliferation of 2.4 GHz technology allowed the complete elimination of transmitter impound, with those flying on 72 MHz each operating on their own specific channel.

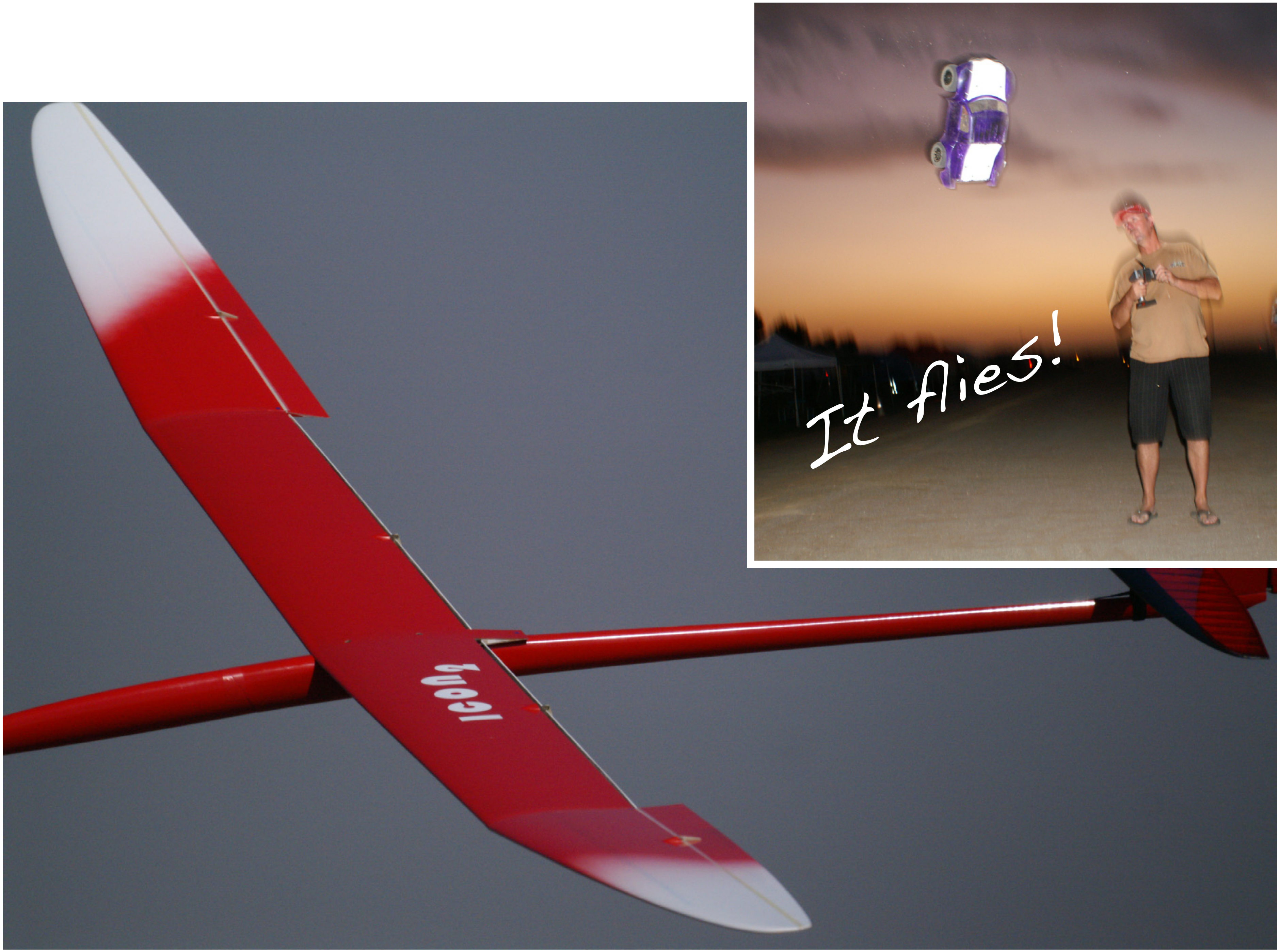
Time to build another sailplane!

B²

Central Valley R/C

Visalia 2011

Photos by Brendon Beardsley, Bill Kuhlman, Mark Vance and Alyssa Wulick


It flies!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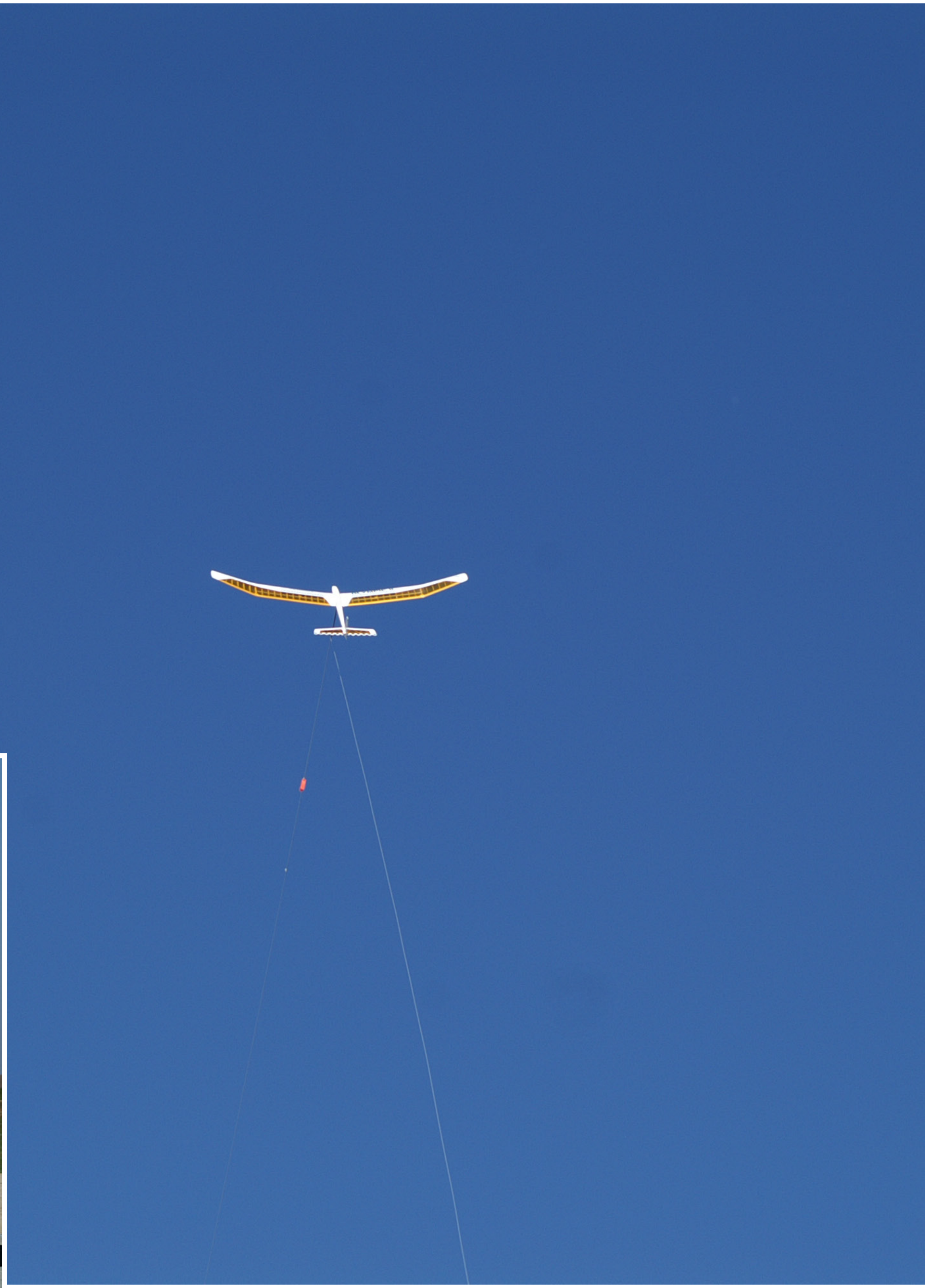
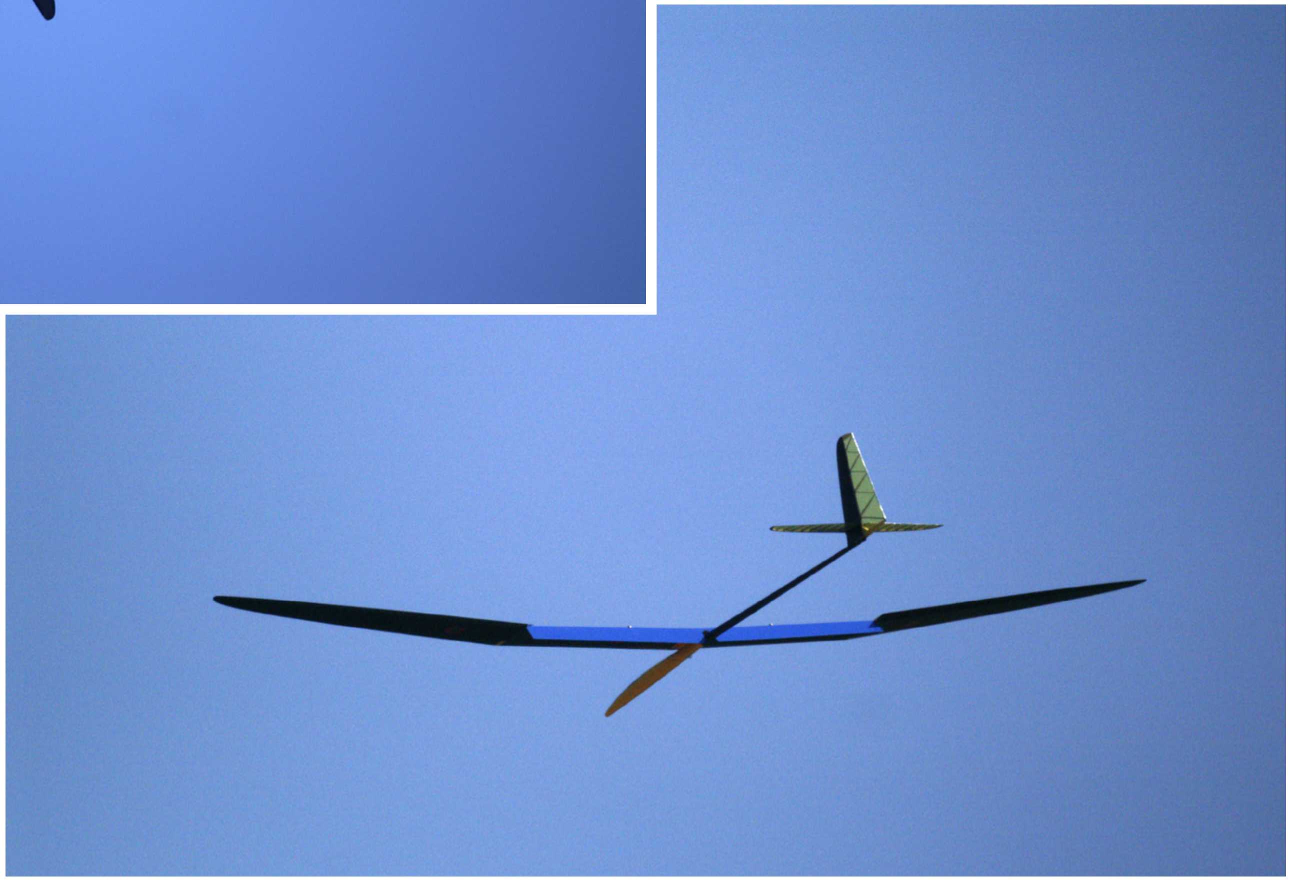





AMA 388

Let's talk yaw stability

Marc Pujol, marc.pujol1@free.fr

For decades we all have calculated our model thanks to some formulae. I still remember this time where computers were not so familiar and where we were using those famous "Texas Instruments" or "Hewlett Packard" calculators... that's 30 years ago! I was under 20...

At this time, I was very surprised not to find any good and complete formula to define the vertical fin. The only thing I found was a general statement on a percentage of the wing surface. Nothing like the tail volume calculation formula. Very frustrating.

Everyone applied some experienced rules (more or less efficient) and got inspiration from aircraft produced by the full size aviation world.

And the fuselage length was quite different from one type of aircraft to another: sometimes short, sometime as long as half of the wing span, sometimes as long as the wing span, and sometimes even more.

Where is the truth?

This was so until Mark Drela published his AVL and Andre Deperrois provided us with his wonderful XFLR5 V6 software.

So let's have a look at yaw stability comparing calculation and experience.

Do gliders fly straight?

The answer to this question is NO ! NEVER !

This is quite surprising but measures made on radio-controlled gliders with a yawing flag provide us the answer (see http://www.xerivision.com). The flight is not a straight flight. It is a combination of oscillations on all axes. Such oscillations in yaw are up to +/- 3 degrees and +/-1 m/s in pitching.

The oscillations are due to any turbulence or action made to drive the model. Look how often you use the sticks! Every two to three seconds you act on them.

And when you do not act on them and you think that the flight is straight, you are cheated. A yawing oscillation of +/- 3 degrees is nearly impossible to be detected from the ground. Even with a camera, such oscillations are difficult to see. Put a flag on the plane and a camera behind it or register the signal with the "xerivision" probe and you will see them.

The consequence of such slow and tricky movement on the gliding ratio is a loss of one to two points. This is more or less the gain you can obtain if you do adapt the wing's profile to each wing section Reynolds number. This means that all the famous calculations made with any sophisticated computer are a waste of time. You think you have the best plane, but the plane may become a standard one if not well studied in terms of stabilities.

You then have a first interest to be sure that your model gets the right stability.

The benefit we can also obtain from good yaw stability is on circling ability. The more the model is circling with a high angle of attack, the lower is the margin from stalling. And stalling is easily obtained by adverse yaw that is generated by any aileron movement during a flight at high angle of attack. When the flight is at low speed - high angle of attack on the pitch axis - the adverse yaw is more important. The plane yaws, so the speed reduces, and then the stall occurs.

One easy way to reduce such stalling ability during circling is to increase the yaw stability.

Dynamic stability

Why do we have to study stability "dynamically."

Nature hates changes. Every time you try to change the way it goes, there is opposition. We call it "inertia." The more abrupt the change is the higher the opposition is. Think at your life. You are also conducted by such rule!

The movement change you want to impose on the model is then slowed and it does not follow the exact movement you wanted. Furthermore, movement may occur with some oscillations more or less amortized.

All our previous calculations were performed in a "static" mode. This means that everything is stable and not subject to any turbulence. Of course this is rarely true. As we said, we are acting on sticks every one to two seconds. We then have to think "dynamic." This means we have to predict the way the model is passing from one stable trajectory to another stable trajectory after a command or turbulence.

All such things are not new at all. It has been taught for decades, nearly a century in fact, in our university.

But formulas are quite complex and calculation is then not easy with our "10 fingers computer."

Thanks to well studied software, things are now different and all the math behind the formulae can be a bit forgotten. We can now explore the dynamic aspect without having a high degree of knowledge. This allows us to predict model reactions to any turbulence. We can then predict whether or not models are efficient on the yaw axis. You can be sure that any competitor is going to look at it. Mark Drela has already done it for years for his Supra, Supergee and so on. Thanks, Mark, for giving us some so useful tools.

Where do we have to think "dynamic" for our models.

Pitch axis

Pitch is to be studied with "dynamic tools" in order to predict the "neutral point." This is the point where the horizontal rotation axis is passing. This is quite important to predict the place of the CG (Center of Gravity) of the model. In order to have a "neutral" movement, the CG will be placed just a bit forward of that point.

Since the main mass are the wing and the radio, quite close to the pitch rotation axis, inertia is quite reduced. That's why we can use, and we have been using for decades, the standard static formula, also called the tail volume formula.

Roll axis

The roll axis is passing through the fuselage from the front to the rear. The wings and their mass, generally 50% of the weight plane, are quite far away from this axis.

Dynamics are then important to predict the roll rate of the model.

Everybody knows that the lighter the wings are, the easier is the roll rate.

Yaw axis

The yaw axis is located vertically and is passing somewhere near the CG.

All plane masses are then quite far away from this axis.

Yawing is then THE topic where “dynamic” is important.

How to characterize dynamic yaw movement

The “yawing” movement is quite a complex one. It is not a pure movement around the vertical yaw axis. It is a combination of movement around the three axes (pitch, roll and yaw). It is also called the “Dutch roll.” (See Illustrations 1 and 2.)

Two parameters are important:

• The frequency also called “Dutch roll” frequency. Frequency is mainly depending upon efforts from the fin. Of course the size of a model is quite important. The oscillation frequency of a small plane is bigger than the one of a big plane. The oscillation also depends upon speed. As an example, the frequency is about 0.4 to 0.6 Hz at low speed for an F3J model. This is then not a speedy movement, one oscillation every 2 seconds. That’s why it is not easy to see it from the ground.

• The amortization factor. Amortization mainly involves Inertia. The higher is the inertia, the higher is the time for the plane to recover a straight flight after a deviation. At low speed, the less stabilized planes, let’s take a 3m span glider, get eight to ten seconds to amortize the movement. This represents 3.5 oscillations. This means that planes require 80 m to get stabilized! In the opposite, a well studied plane like the original Supra requires only three seconds in the same condition to be stabilized (25m). One third the time!

Planes that are not well amortized in yaw will appear “heavy” in such axis. This is due to the fact that any action to the yaw stick will require time to be executed and also more time to be stabilized. As pilots generally adjust their commands every two seconds, the position of the plane in yaw is “somewhere,” but never where the

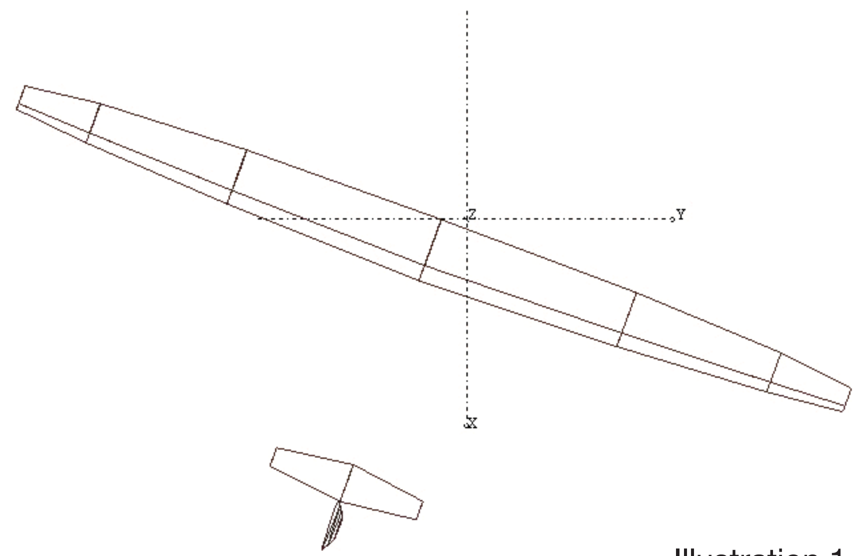


Illustration 1

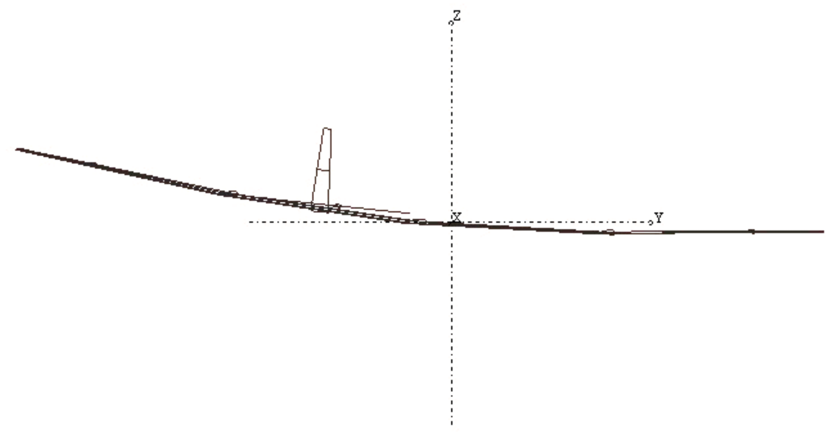
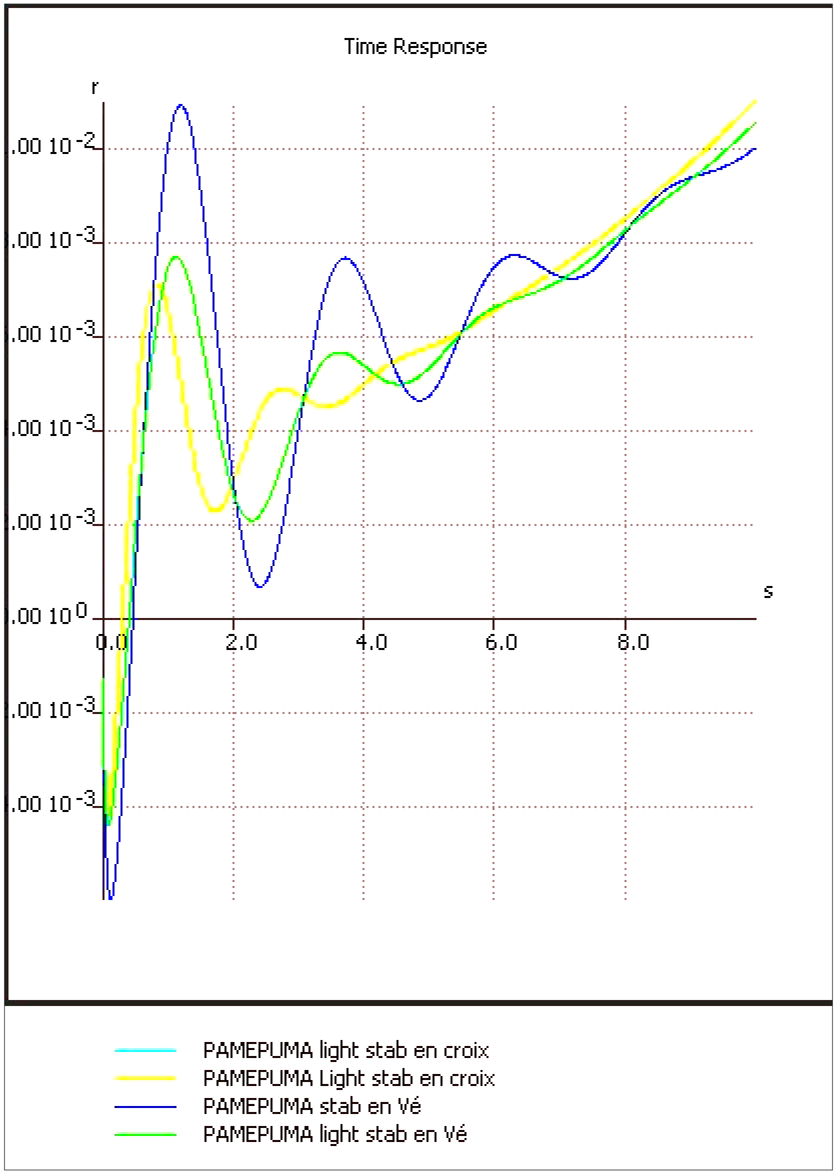


Illustration 2

“Dutch roll” flight representation provided by XFLR5. The top and rear view shows the complexity of the movement, a combination of oscillations around the three axes.



Oscillation graph provided by XFLR5. Whether the plane is well amortized or not, the result is quite different.

pilot wants. The only way to manage such a plane is to play with the plane, slowly, gently... And sorry for the air turbulences! They will destroy the gentle and smooth flight. You better see now why yaw is so important in circling. (See Illustration 3.)

Let's make few experiences on yaw stability

I have the chance to get one wing that is capable of being installed on two planes. The first one is an F3B plane with V-tail created in the 90s, the second one is using the same fuselage but with an X-tail and it is calculated to be far more stable in the Yaw axis. Both planes are of the same weight and same CG.

PAMEPUMA: An F3B plane of the 90s. The father of such plane is M. Patrick Médard. The "light" version is here presented. (See Illustration 4.)

PAMEPUMA with X-tail fuselage. Proportions are not unlike any F3K planes - even the fuselage length is representing 1.25 times the half span. Proportions are still not so strange for the eyes. (See Illustration 5.)

In terms of projected surfaces both fuselages are quite equivalent. (See chart on next page.)

The fuselages do differ. (See Illustration 6.)

Several pilots flew the two planes. Their conclusion was crystal clear. The V-tail version is difficult to circle, as any modern F3B plane, while the X-tail version can be managed as an easy glider.

On the one hand:

- The V-tail version requires 50% aileron differential and the flight must be very well anticipated and managed.
- You are driving a truck.
- It is also difficult to circle at low speed. Only flat and large circles can then be performed. It is a "standard" F3B machine.
- The yawing management is performed with big orders on the stick.

PAMEPUMA V

PAMEPUMA X

Model	Developed surface	Projected vertical surfaces	Vertical efficient surface
PAMEPUMA V	8.5 dm² (V)	4.86 dm²	2.78 dm²
PAMEPUMA X	4.79 dm² (fin)	4.79 dm²	4.79 dm²

Comparison of the two fuselages. Yes, there is a difference.

On the other hand:

- The X-tail plane is fully different.
- Circling is easy and does not require anticipation.
- Small orders create “immediate” and “precise” response on the yaw axis.
- The inverse yaw effect during circling appears to be small and is easy to correct with very few commands required.
- Very small turn radius at low speed is now possible.
- Glider is now more agile. It is a plane for a beginner.
- It is not a transformation, it is “a revolution”!

Does XFLR5-V6 predict this? Of course!

XFLR5 modelisation

XFLR5 modelisation shows the following:

- The X-tail version is developing 2.4 more torque around the yaw axis compared to the V-tail version. This is the consequence of the V-tail efficiency effect, a V-tail fin is 0.57 as efficient as an X-tail fin for the same vertical projected surface, and the bigger level arm of the X-tail version. (See Illustration 7.)

Why increase the fuselage length?

In order to create efficiency in the yaw axis, it is required to generate torque and amortization.

This can be done by two ways:

- Increase the vertical fin surface
- Increase the lever arm.

It is demonstrated that the lever arm increase is far more efficient in terms of stability. An increase of 10% of the lever arm generates a 21% increase of the amortization factor (1.1*1.1=1.21). An increase of 10% of the surface is only creating a 10% improvement in stability.

An increase of 10% of the yaw torque capability will then have a different improvement consequence. There is then a certain interest in adopting a long fuselage.

Look at F3K, aerobatic planes, beginner’s planes or even an F5D racer. They still know it.

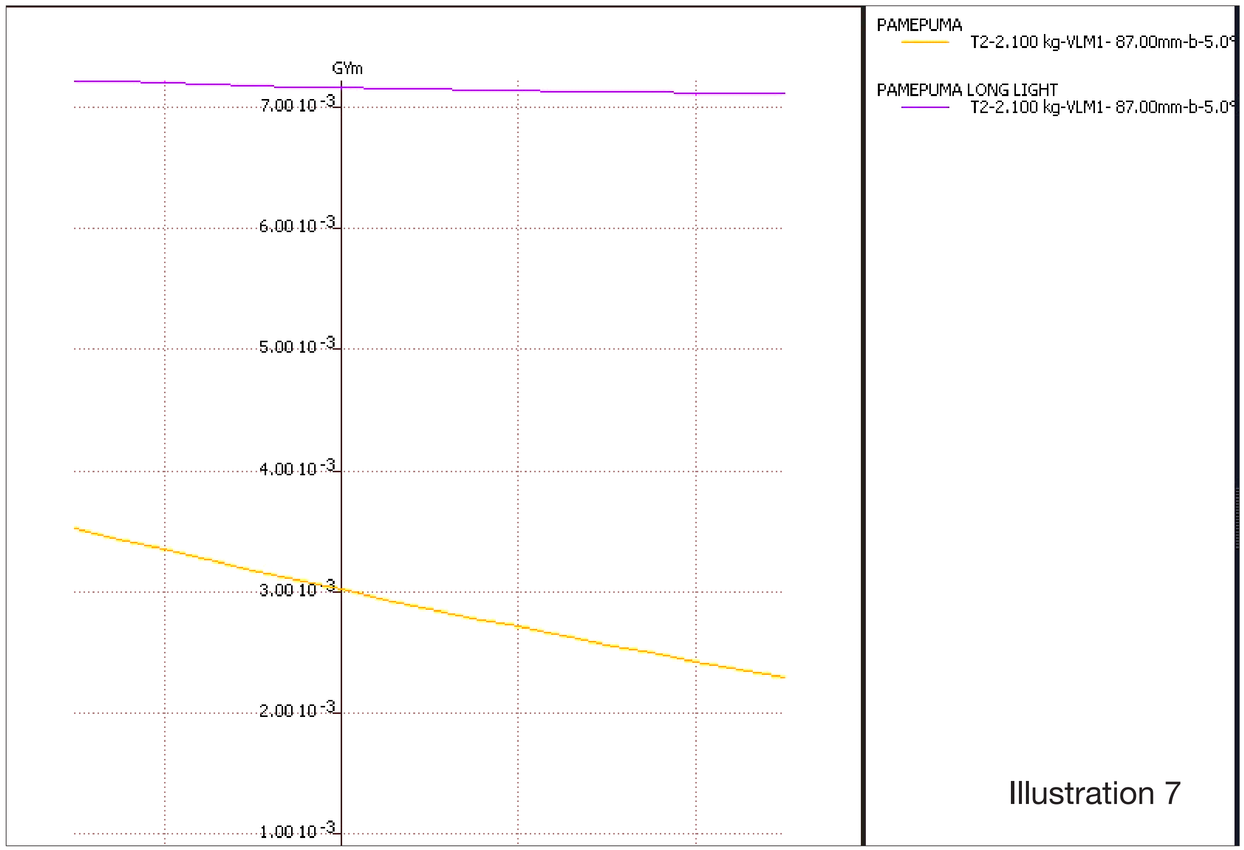


Illustration 7

The yaw moment coefficient of the X-tail version is 2.4 times the V-tail. This is the main reason why the X-tail version is so easy to fly.

Illustration 8

Illustration 9

Above, Illustration 8: The Xerivision yaw sensor system *integrated into a streamlined pod.*

Above right, Illustration 9: At this time the Xerivision system was not integrated into a pod... But that's experimentation !

Right, Illustration 10: The Xerivsion yaw probe. This is the first probe tested. New probes are now half the size.

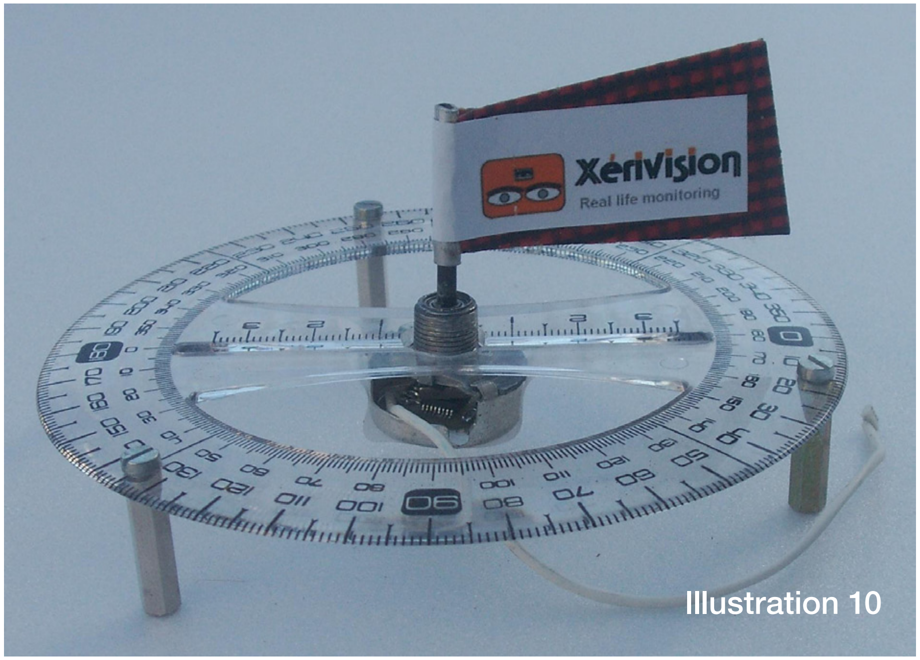


Illustration 10

Is XFLR5 representative of reality?

Having the two planes (See Illustrations 8 and 9.), a Xerivision "data logging" system, and the famous yaw probe of the same company (See Illustration 10.), we decided to make a registration of all movements during a calm winter day.

The system allows measuring up to 10 times per second the following parameters:

- Altitude,
- Speed,

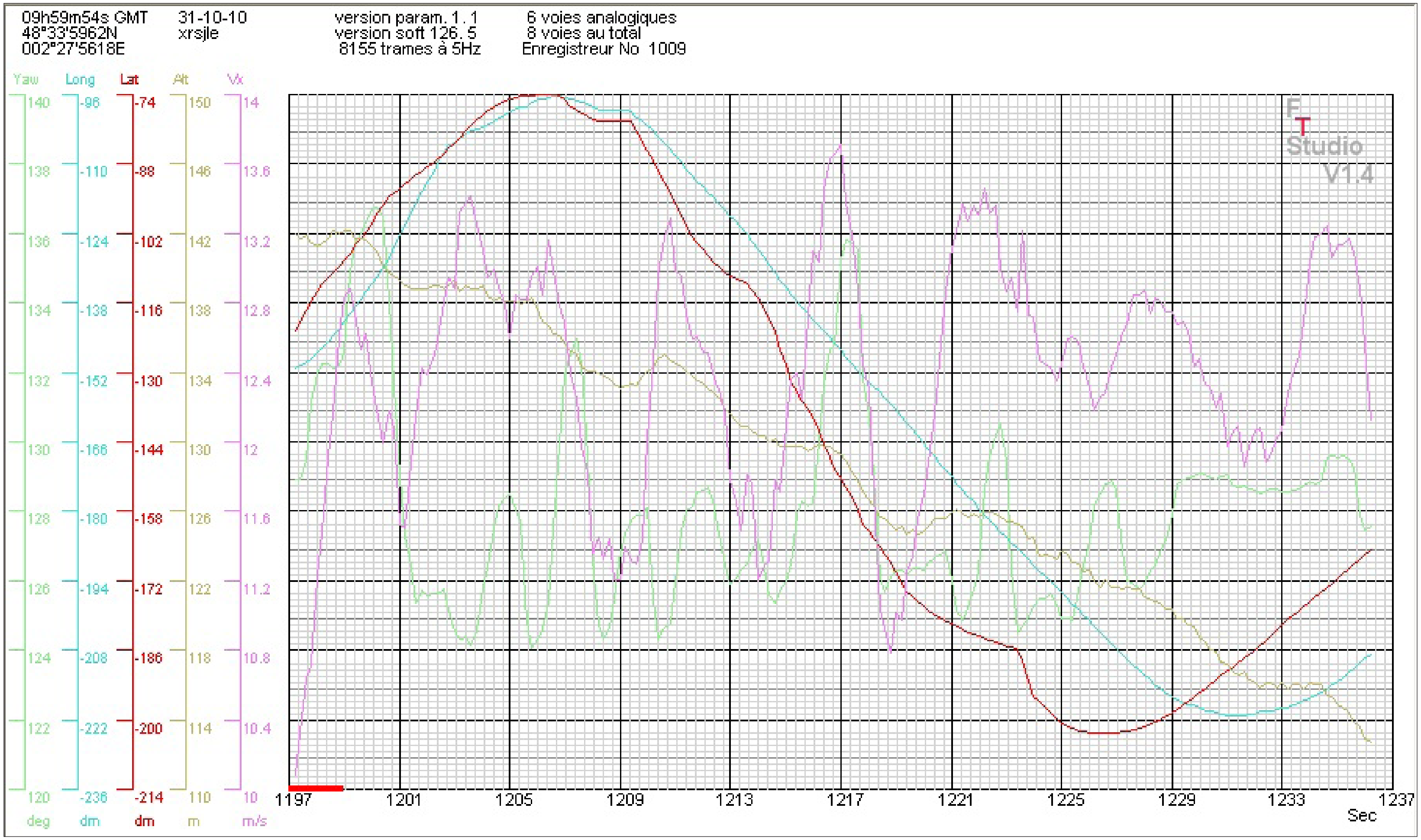


Illustration 11

- Latitude,
- Longitude,
- Acceleration in:
    - X,
    - Y,
    - and Z,
- Yawing
- Plus additional data (temperature, rpm, etc.)

In order to have a long flight registration (more than half an hour), but quite a good sampling, it was decided to store five data batches per second. This is the minimum if you want to have good and easy data for interpretation.

(See Illustrations 11, 12 and 13.)

Yaw measure of a typical light F3B model with V-tail. Trajectory is straight and it takes more than six seconds to recover a straight flight (frequency of 0.43hz). Oscillation amplitudes are never less than +/- 2 degrees. Note that flight speed and altitude are in phase with the yaw. It is an amortized Dutch roll trajectory.

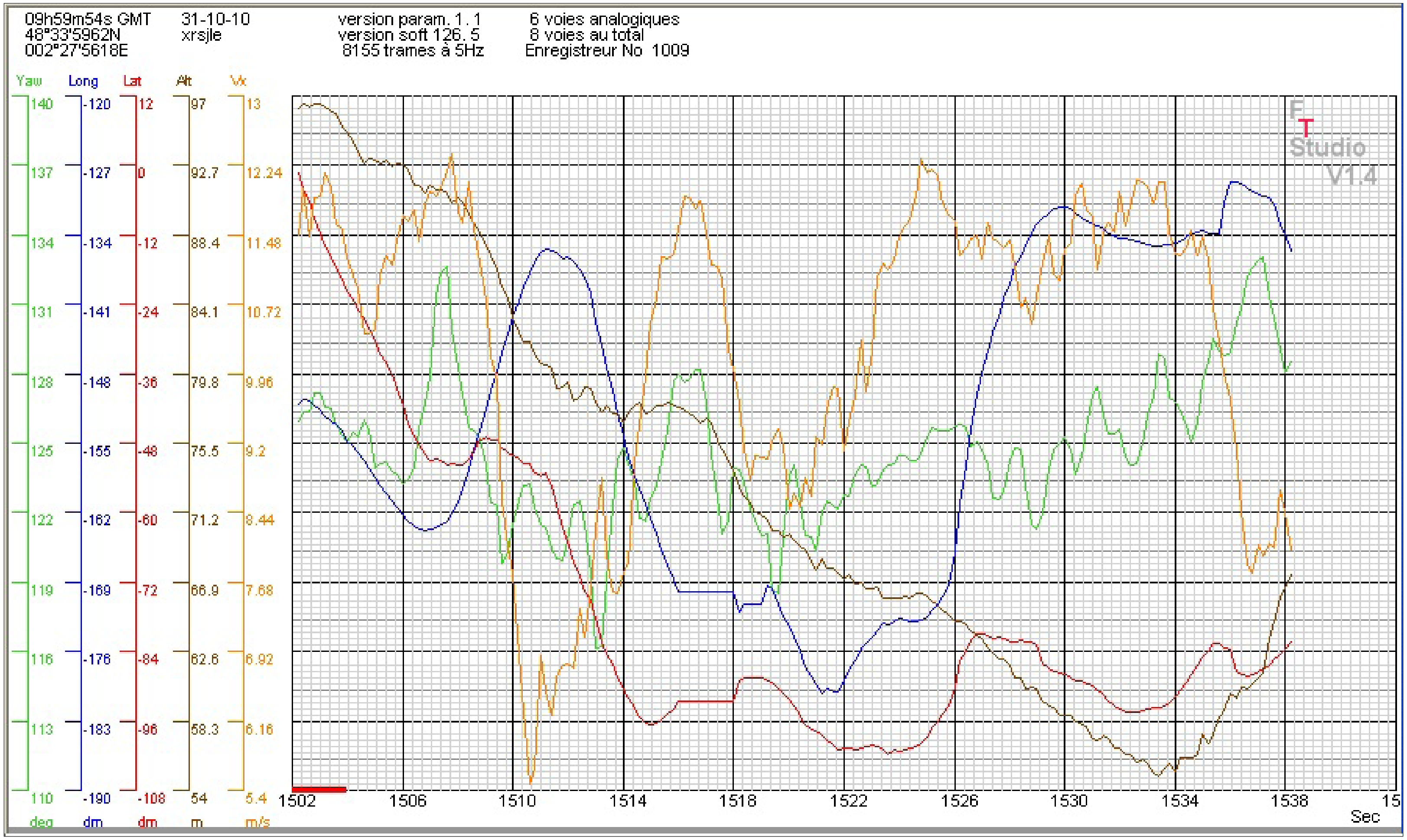


Illustration 12

Yaw trajectory of the light F3B plane using aileron and V-tail in conjunction. Oscillations are +/- 7° maximum.

Note: Radio controlled systems with on-ground return of flight information seem to be not so powerful as the Xerivision system. They provide one or two sets of data every second. Not enough for flight data analysis.

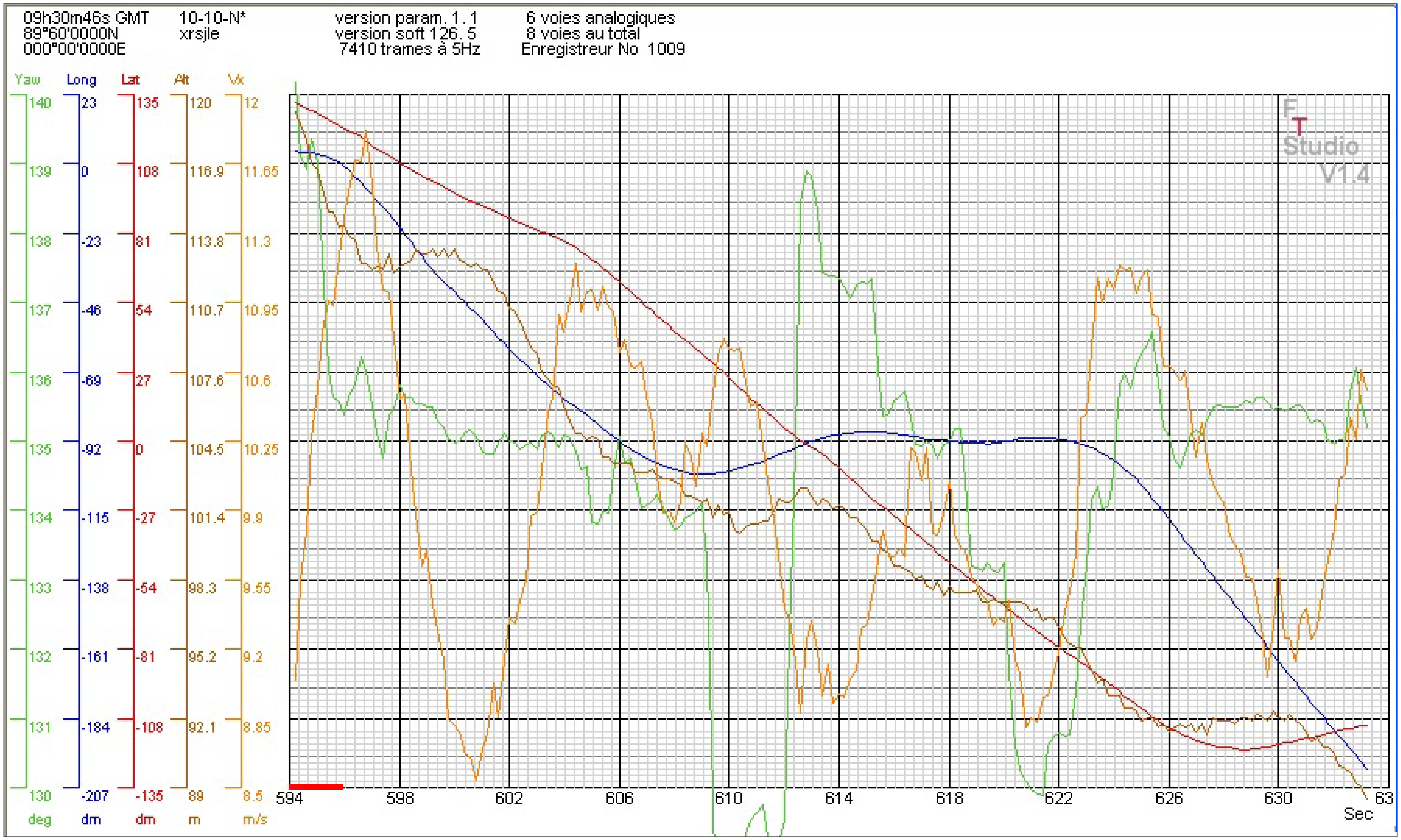


Illustration 13

Trajectories with a "well amortized" yawing plane. Every direction change (at 594s, 613s, 622s) has been performed with rudder only. At 610s, exercise have been made in putting rudder in one direction then opposite then neutral till recovery. Amortization is in two periods (less than four seconds). The flight is then straight (yaw oscillation less than 1°).

At the measured average speeds, the predicted trajectories are the following:

Plane	Speed (m/s)	Yaw frequency (Hz)	Number of periods to recover
V	10	0.42 (theory) 0.43 (measured)	3 (theory) 3 (measured)
X	10	0.6 (theory) 0.7 (measured)	2 (theory) 2 (measured)

Computation and measure are not so far away from each other. It has been estimated, thanks to the precision of all measures made (including plane weight, etc), that the precision that could be reached is better than 5%. That's all we want!

Are our planes optimized in terms of yaw stability?

Let's talk yaw efficiency of our plane. three planes have been evaluated:

The original Supra (the one produced, homemade, in 2004), an F3J plane as you can purchase, and an actual F3B plane (they are nearly all equal in yawing).

Model	Time to recover a straight flight	Number of periods to recover
Supra Original	2 seconds	= 1
F3J plane	< 5 seconds	= 1.5
F3B plane	6 seconds	> 2

In terms of efficiency, the Supra Original is optimum. It has been studied with AVL and Mark Drela perfectly knows what he did.

Actual modern F3J planes are not so efficient in yawing. Of course they are not so difficult to circle with. But improvement can be easily made.

Actual F3B planes can be characterized as "the worst." Their circling ability at low speed is very low. They can very much be improved.

If you make the same comparison at high speed, things are the same. The distance to recover a straight flight is a constant for each model. It doesn't depend upon speed.

The GENOMA: A 3.65 F5J unlimited plane optimized in yawing. Look at <http://www.xerivision.com> or <http://www.f3k-fr.com/f5x/genoma/genoma_index.html> for more details. There is a complete pack of data to construct it (200 pages plus CNC files and profile charts). Sorry, only in French for the moment but lots of photos are provided.

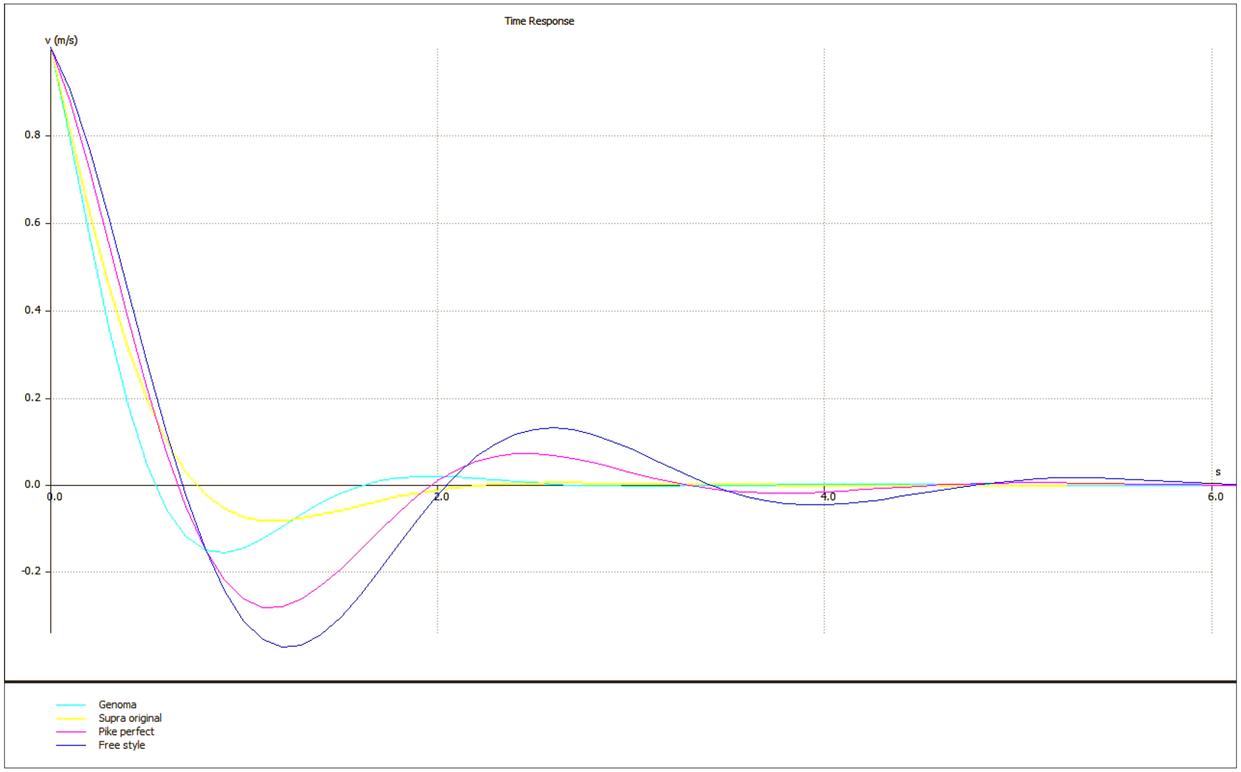


Illustration 14

If you compare several types of planes, the best yaw efficiency is obtained by the original Supra (in yellow), then the actual F3J planes (in magenta), then modern F3B planes (in dark blue). In light blue is the performance of an own design F5J, the Genoma.

What can we do to improve the yaw efficiency?

The first rule we can apply is to lengthen the fuselage. To be simple, the total fuselage length may be 1.25 the half span. It is like an "Easy glider."

The second rule we can apply is to size the fin in order that its surface represents 8 to 12% of the wing span.

The third rule is to limit the weight of any plane parts which are far away from the plane rotation center. We then need to lighten fin, tail, wings.

As you see, this is not very new at all. Lots of planes already apply it.

Of course, for optimization, AVL or XFLR5 are very useful and representative tooling. So let's use them. We still have some improvement to perform.

Kinetic 100v2 on display at the Deutsche Museum Technik

Steven Seim, sseim@comcast.net

The Kinetic 100v2 is now on display at the Deutsche Museum Technik, Munich Germany. Here are a few photographs.

The current acknowledged record speed for the model is 468 mph. Refer to page 55 of the May 2011 issue of RC Soaring Digest for more informationon the model and its placement in the museum.

It looks to me as if it's in the same building as the Horten IV. I'm working to get that confirmed. To be co-located with the Horten is an honor that means a great deal.

“Spread tow” photo by Brendon Beardsley. Nikon D700, 1/500 sec., f4.5, 50mm

Old Sealy Constellation XC 'ship exposes some old "why's" of task sailplane set-ups

Gordy Stahl, GordySoar@aol.com

Lee Murray of Appleton Wisconsin built this bird a lot of years ago...and passed it on to me. The “kit” was from Bob Sealy of Cookesville TN.

I have included here all I have on it and a few photos from clubmate Allen Burnham.

When I got it the CG was set per plan... wayyyy forward.

The pushrods were as per their day - very flexy - so if the model were to slip into a dive, they would buckle and the model would “tuck” to a speed that it would likely blow up.

I put strong Volz metal geared digital servos in the tail for both the rudder and the stab, making them rock solid.

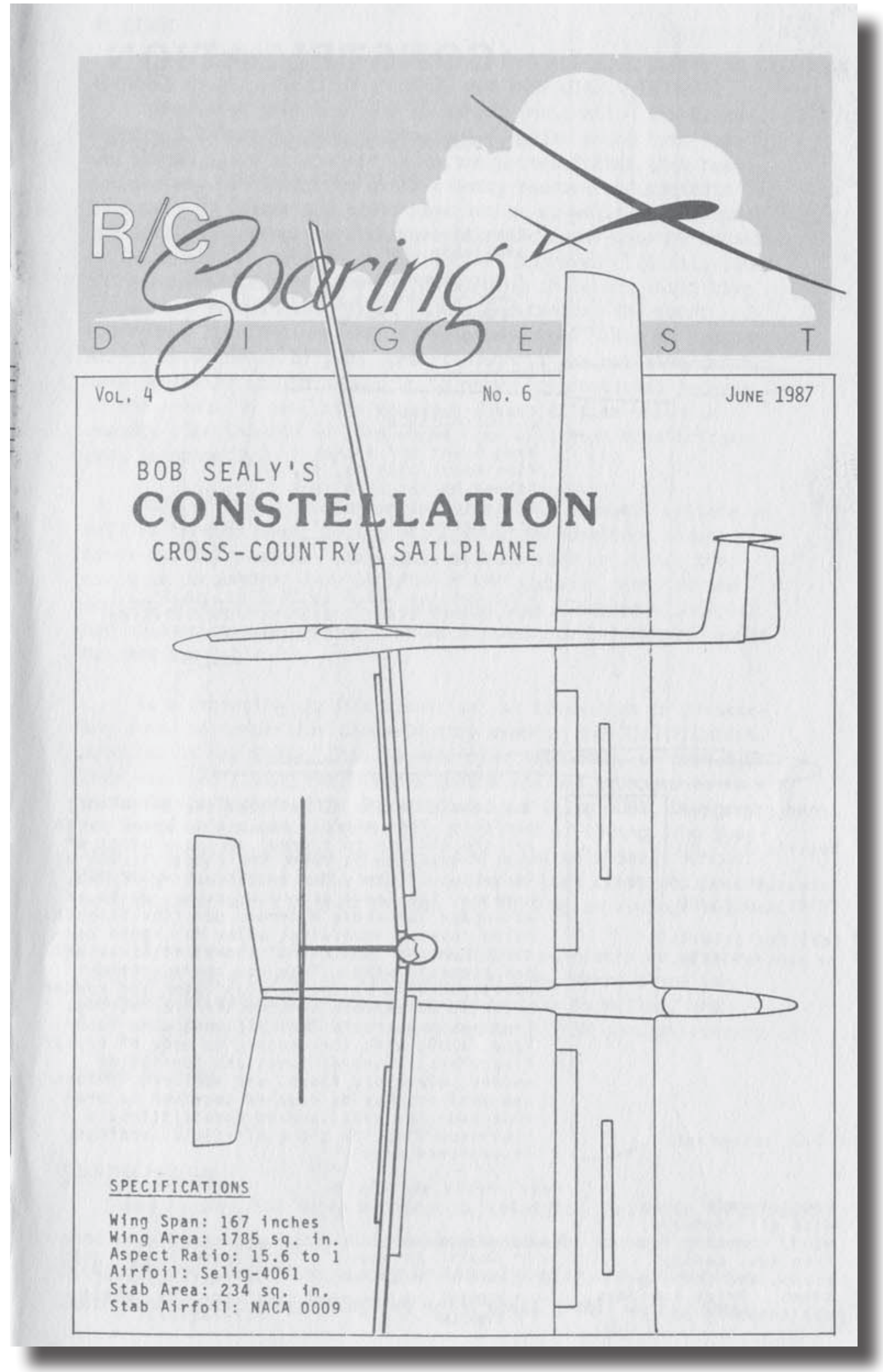
When I got the model, no human could hand toss it to a glide. After tightening the rear end surfaces I was able to remove lots and lots and lots and lots more lead from the nose. I can now give it a strong left handed toss and she will glide way out with no pitch correction!

Of course that’s not an optimum set up for XC work which is done mostly above visual cue heights, but it helped me understand why models were balanced as they had been — at about 30% with lots of up trim in the form of stab incidence — and why they don’t need to be now days.

It also made it clear to me why so many great sticks of the past have such a hard time coping with new molded models which are set with almost zero incidence and lots less nose lead.

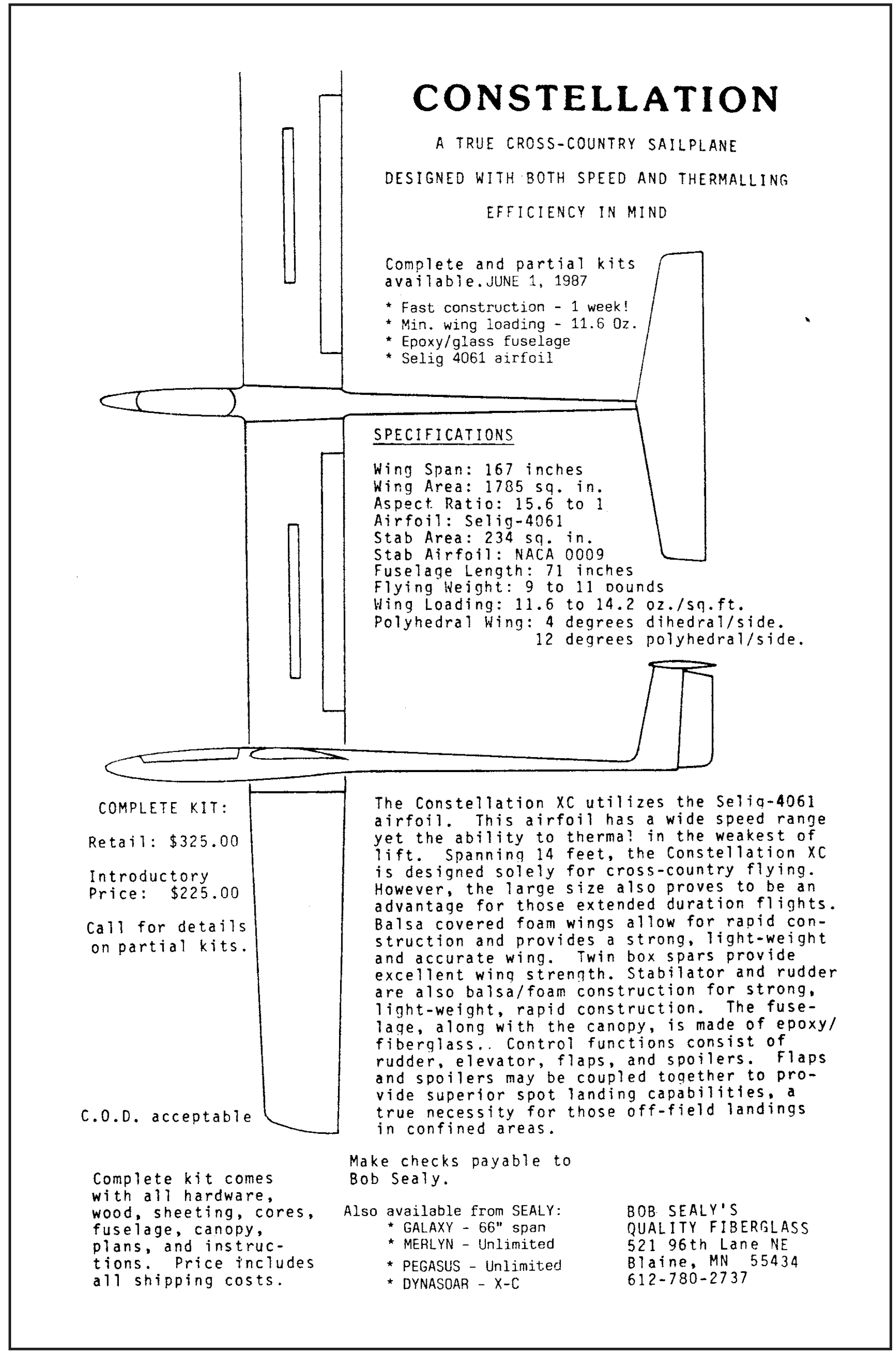
The old model set-ups protected the models from over speeding, but made the pilots learn to fly them at a very specific airspeed. The really great pilots were great at doing that, most pilots not so much.

However, the real reason for that set-up system was lost along the way, but became the mantra of club “experts” for years after and even today is still professed to the detriment of the hobby and its pilots.



Lee Murray and the Sealy Constellation

Gordy in the process of determining if the Constellation can be discus-launched. Yeah, right...



The Constellation in flight.

It caused the learning curve to be side tracked and distorted to the point where pilots never progressed up the contest score board, and kept many from even trying.

The new molded models didn't have cares about diving speed, they simply didn't care. Even if left to straight down 1000'+ dives, they just pull out when asked. The issue of "aero-elasticiy" of model designs exposed by JW on RCSE years back doesn't exist with new lighter and stiffer models, coupled with the unyielding holding power of today's digital servos.

In any case, the Constellation was my first "giant" sailplane and it taught me a LOT!!!! About CG, dihedral, tip weight, and the effects of too much surface movement. It gave me a real test vehicle to prove or disprove things I'd heard and things I'd learned. It caused me to ask new questions, and luckily the guys who I needed to ask were still around.

The Constellation is a wood over foam wing model. It's big, lumbering and impressive, and I'm lucky to have gotten it and lucky to still own it in great condition.

Take a look at the photos and the specs, you'll see what I mean.

Big thanks to Allen Burnham for getting the photos. I didn't know he'd taken them until today; the photos had been taken in September of 2009!

If you have questions about the Constellation or my musings on the hobby, feel free to contact me at <GordySoar@aol.com>.

See you on my next "trip"!

Gordy

Above and left: Strong Volz metal geared digital servos in the tail for both the rudder and the stab, making them rock solid.

Volksrust 2011

Photo album by Piet Rheeders, pietlewis@absamail.co.za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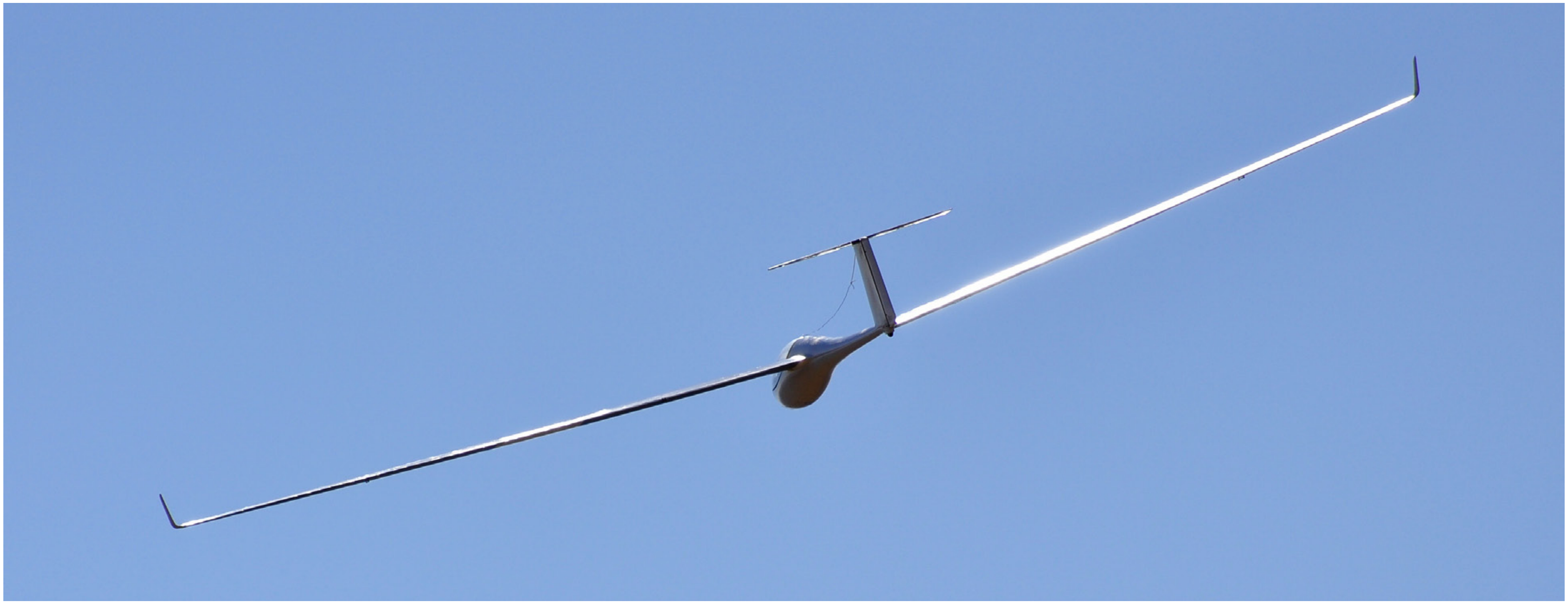
IX

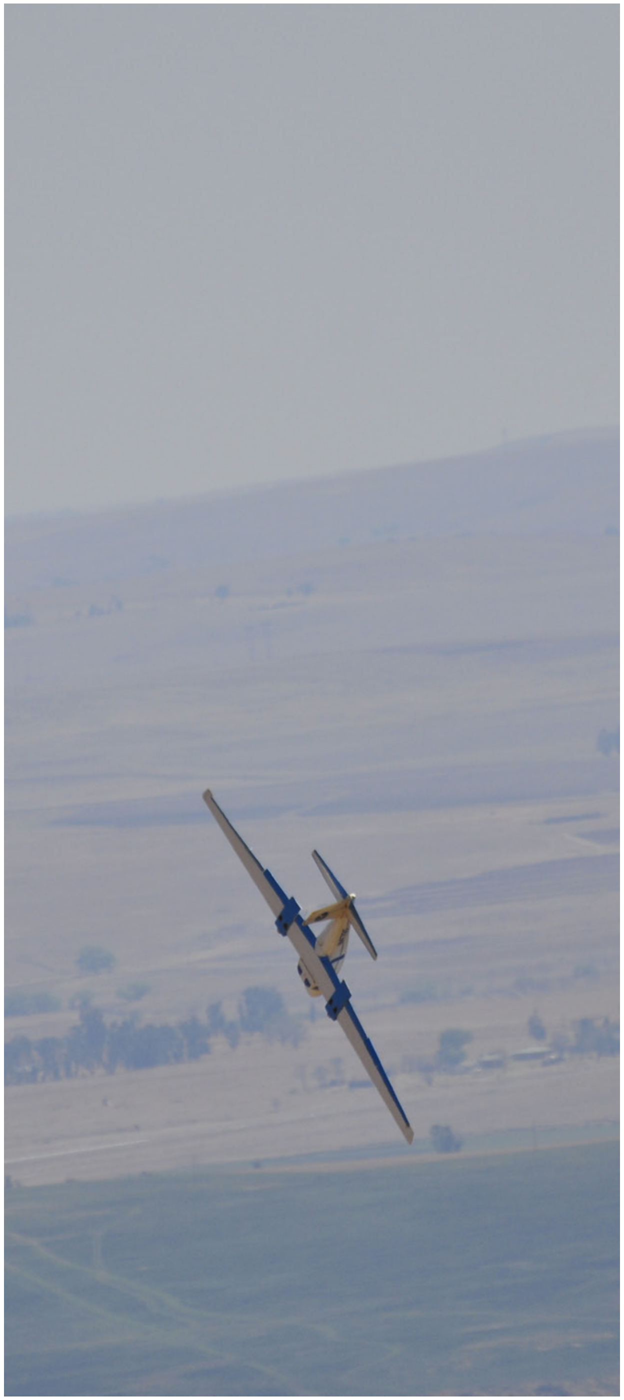
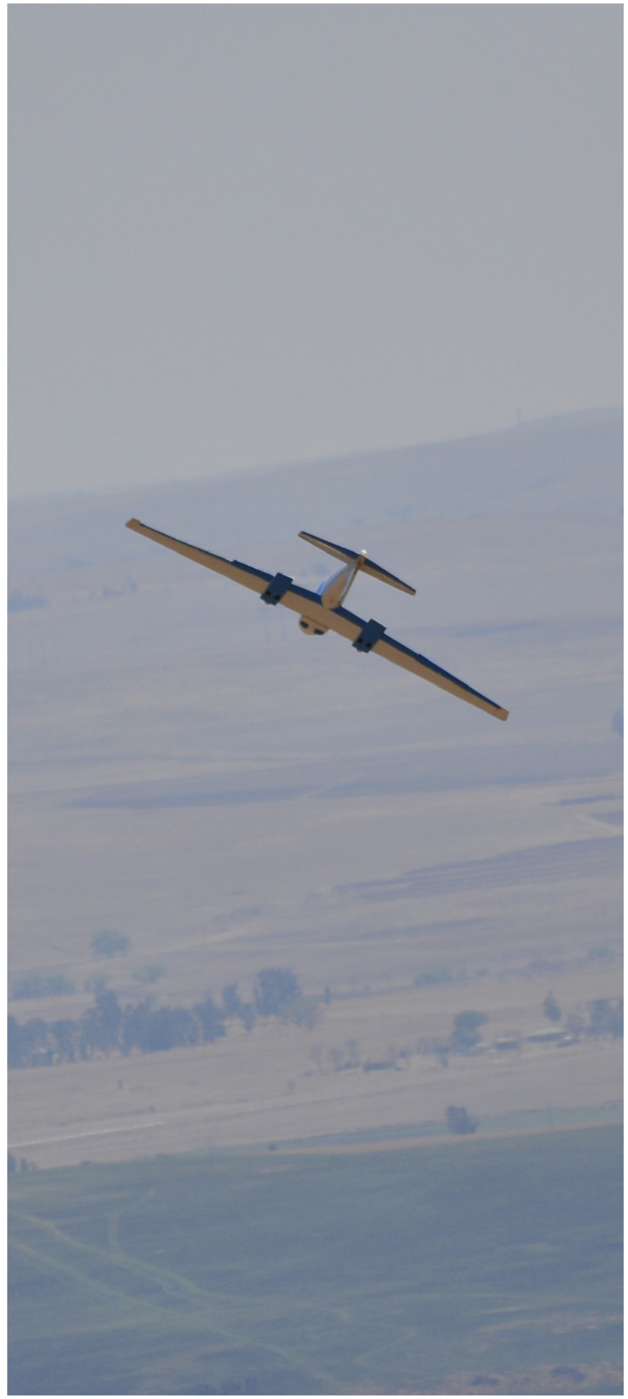


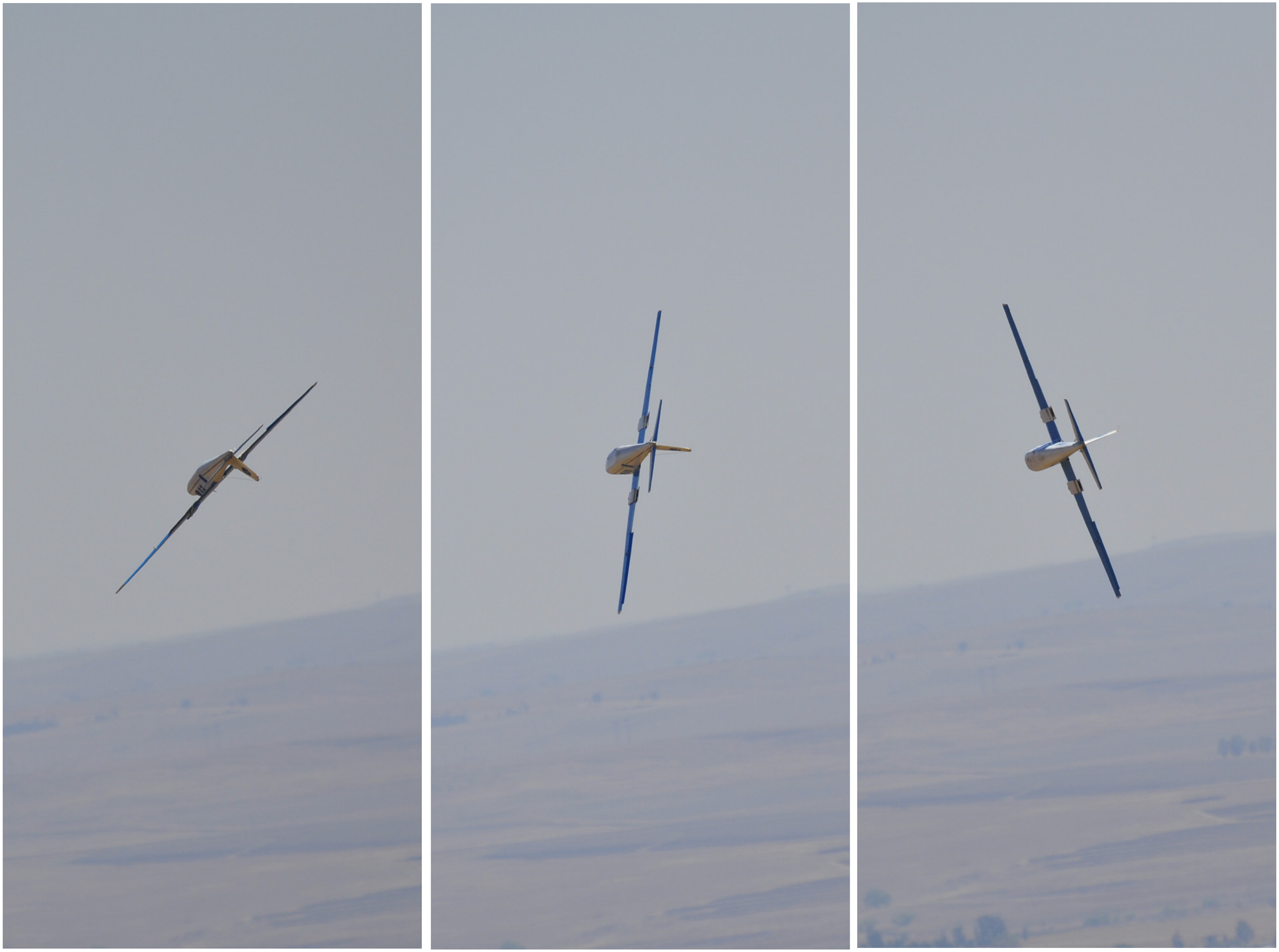
The trip down to Volksrust was one of the better kind in terms of the consistent wind that we had, but the highlights for me was, and as you probably can see from the pictures on the back cover, when there was the smoothest of valley release air late Saturday afternoon when all four of us were flying.

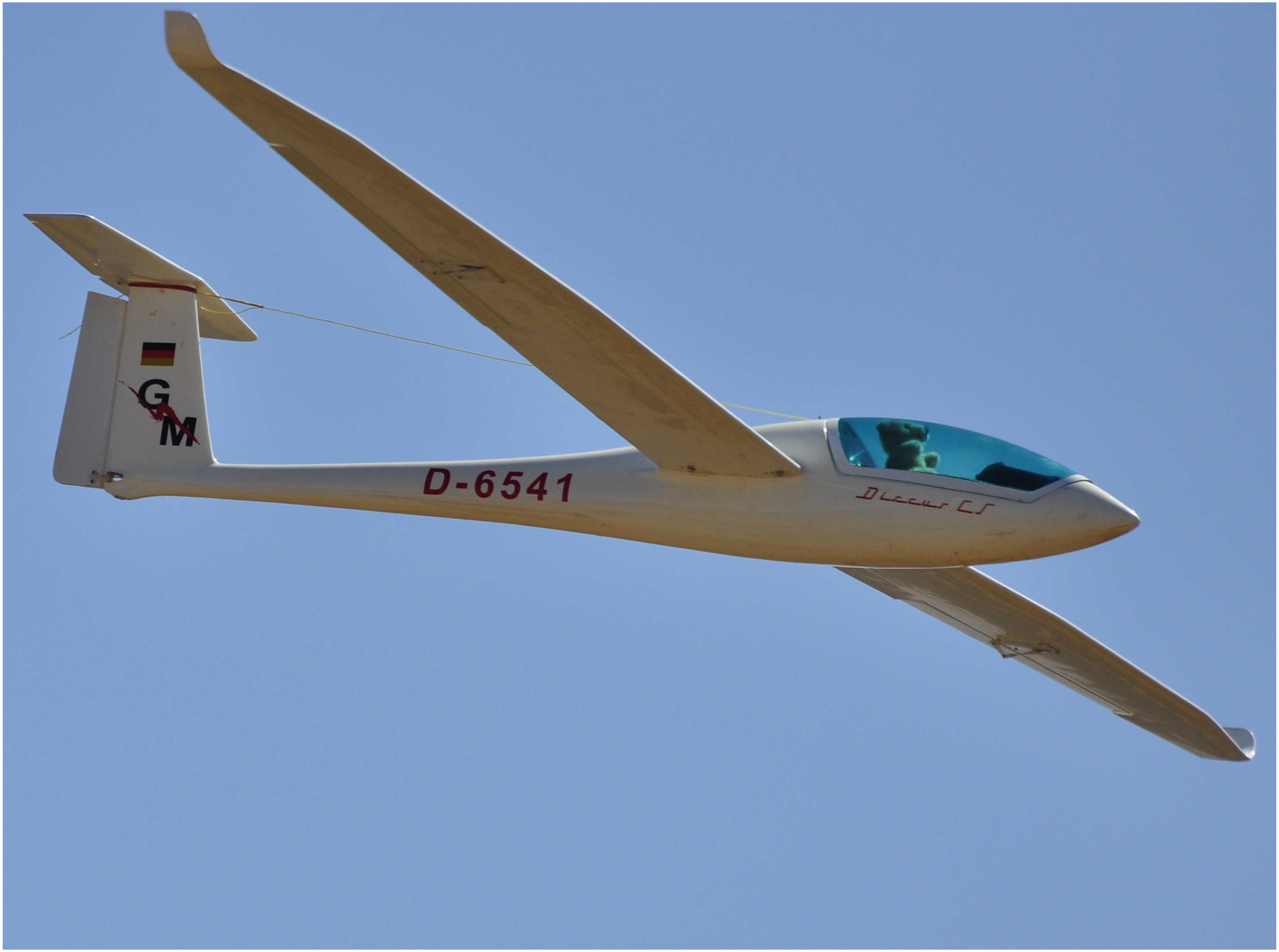
At some stage I started to realise that with the sun setting and the valley below, basked in this magnificent gold tint, that I had to land and capture the moments on camera — a decision and an experience I won't forget in a long time. In the short time of around 10 to 15 minutes I got really trigger happy captured nearly 60 pictures, and can still not decide which one is the best.

(Editor's note: The editors went through Piet's complete collection and decided to use what was felt to be the best of the series on the back cover, page 108, of this issue.)




D-6541
Discus CS
GM


ZT
D-2003


27
D-2003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D-2003


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D-2003

We also had some time early on Sunday morning to do some E-cross-country flights with Evan and his E-Tsotsi doing away trip and myself the return trip. The wind did pick up reasonably early and our 2 meter sailplanes did suffer due to the lack of penetration and cross winds.

I made a custom intercom system and although driven by 9v batteries, it worked perfect. I also had a data logger aboard my E-Tsotsi. My personal longest distance that I have done so far was 75km and I will be looking to better this by the end of this year when we will deviate from our normal visit to

Volksrust and instead go to the semi-desert region of the Kalahari and Namaqualand about 1000 km south/west from Johannesburg. The roads in this area are very straight and typically small towns are separated by vast distances. Daily temperatures here can soar to 40 deg C/ 104 deg F during December. There are lots of saltpans that can stretch for between 60 to 100km alongside the road and my common sense tells me that there should lots of thermal lift around, but until we have done it I cannot tell for sure.

2nd Cremona Gathering

Vincenzo Pedrielli, vincenzopedrielli@gmail.com

Minimoa on tow

TOW PILOTS AND THEIR PLANES

Zema Fabio with Pilatus Porter

Barbieri Nelson with Bidule

Goletto Fiorello with Patchwork

Vimercati Alessio with Piper

Ungari Simone with Big Lift

Mirri Roberto with Patchwork

The "Gruppo Aeromodellistico Cremonese," led by the enthusiastic Marco Pattoni, organized the 2nd aero-tow National Vintage Model Glider Meeting on Sunday September 25th, in the airfield of Annicco, near Cremona. This group is the most active group in Italy, as for building and flying vintage model sailplanes.

Thanks to the favourable weather, the meeting went off safely, exceeded the success of the previous year for the number of participants and the variety of the model gliders.

Twenty five pilots, coming from different Italian regions with 32 models, were present, plus five skilled pilots with efficient tow planes.

Some of them, after having released the model, flew back to ground by performing aerobatic manoeuvres,

including inverted flight very close to the runway. Unbelievable!

Because of good thermals in the afternoon, some pilots flew their model at high altitude, enjoying long lasting flights.

All scale models were reproductions of sailplanes designed before 1960 and most of them built as the originals, with wood and fabric. Ready-made models were not allowed to participate, according to meeting regulations.

Difficult to rank the best looking models, a very embarrassing task! Many of them were reproducing sailplanes designed by the German Hans Jakob, such as the Weihe, Rhoensperber, Habicht, Sperber Junior, Reiher and the famous Meise, winner of the competition for the Olympic glider design of 1939. From Slingsby design, the Petrel and the Kirby Kite and from USA the SGS 1-26 Schweizer and the Super Albatross of Hawley Bowlus. This last one was built in 1:2 scale, quite big!

There was also a quarter scale model of the Maeda 703, designed by the Japanese Kennichi Maeda. The Borea of Teichfuss was the only Italian representative.

Not to disappoint anyone, I like to list all the other model sailplanes participating in the meeting: the Ka2, Jastrzab, Minimoa, Fafnir, SG38, ASK13, SZD Bocian, Pyonir, Lunak, Harbinger, Moswey III, Elf 1 and Macka.

Besides enjoying flying, the meeting in Annicco offered everybody the great opportunity of getting together and sharing the same interest in scale vintage sailplanes.

All have been quite happy of this meeting and agreed to meet again next year, possibly bringing more models of Italian design.

PILOTS & THEIR GLIDERS

Campana Marco : Kaiser KA2

Sacchi Massimiliano : Jastrzab

Facchini Tullio : Minimoa

Simeoni Carlo : Super Albatross

Cobianchi Carlo : Sperber Junior, Fafnir, Sao Paulo

Castelvecchio Pietro : Weihe, Fafnir

Benigni Tita : SG38, ASK13

Corno Stefano : Rehier

Sala Egidio : SZD Bocian

Pompele Nunzio : Schweizer

Gallani Alessio : Pyonir

Tenneriello Andrea : Minimoa

Crugnola Luigi : Slingsby Kirby Kite

Pellegrinelli Ovidio : DFS Olympia Meise

Arrigoni Massimo : Goppingen 1 Wolf

Rovida Roberto : Lunak, Habicht

Condotta Alessio : Fafnir 2

Mantovani Luca : Borea, Harbinger

Pattoni Marco : Moswey 3

Pattoni Giorgio : Minimoa, Foka 4

Pogliacomi Fabrizio : Schweizer SGS 1-26

Zubboli Leonello : Maeda, Slingsby Petrel

Panceri Carlo : Elf 1

Menozzi Francesco : Macka

Borea Teichfuss

Bocian

Habicht

Maeda 703

Slingsby Petrel

Reiher

Schweizer SG 1-26

Harbinger


Berlin 1936
Rhoensperber

Bowlus Albatross

Sperber Junior

north versus south

Kevin Farr, kevin@fvdv.co.za

Thunk!

Fall out of bed at 3:30 am on a Friday to make the blasted flight to Durban.

Now I know what the Durban guys go through every year to attend the TOSS event, and bless their souls for doing so.

The Inanda Dam site

However, there was a palatable excitement as Jeff, Christo and myself converged at the Cape Town airport in the chilly wee hours, with a correx box big enough to carry a fully grown small person, yet filled with our precious toys and now to be handed over to the airlines for transport to the other side.

Following the tail of the cold front that had slammed through the Cape the day before, we made awesome time in the orange tin can with wings, while chewing away on peanuts handed out by men in

orange uniforms… and landed a whole 20 minutes early at the new sparkly King Shaka airport.

We were quickly whisked off to our lodgings by our gracious hosts, Russell Conradt and Dave Greer, not to mention the entire sloping crew in Durban, for an even quicker of an unpack of bags, and into the car for the trip to the Inanda Dam slope to greet the advancing frontal system which promised to push through a strengthening South Wester. (Read North Wester if you're in the Cape... land curve/twist/tilt, that sort of thing.)

Above and opposite page: Michel’s 4m scale glider on an evening flight

Dean contemplates a launch, while one of the locals shows how it's done and then sets in to torment the twin tailled foamie!

This is why we slope!

Left: Dave and Mark chuffed after a maiden flight and jeez does this plane perform something awesome.

Below: A bit of a poke with a stick at the Durb's lads

The Inanda Dam slope is not to be fiddled with! A 200m vertical face at the flight line hits the foot hills eventually, and then tails off for a more or less 600 meter drop to the dam way down in the distance.

Warnings were given that should one's glider advance down to the front of the face of the slope for whatever reason, your glider will stay there... more or less forever... or till the mountain club can get to it slung up in harnesses and things.

Starting out a bit light, within the hour and somewhere around midday, the South Wester started to belt through and the lift went berserk.

Between BEE wing battles, a touch of DS, and general flying, Dave and Mark were able to maiden the new Minivec, Russell was able to make his glider dissapear to a mere dot at the base of the valley while persons fixing roofing in the valley below waved hammers at it, and the aerobatics routine was practiced in some of the most energetic lift we have ever sloped... very much able to rival anything the Cape can offer.

Eventually we all retired to Russel's house and were treated to an awesome braai hosted by his wonderful wife Mandy, and man is she good at the hosting gig! Flawless food, plenty of the liquid stuff, and much laughter saw

all the slope crew retire before the midnight hour for a well earned rest.

Saturday promised a NE blow, so a change of slope was required, more or less the back-end of the front-end that we had sloped on Friday. But mother nature as is true to her form chose to desert us a wee bit and light conditions reigned for the day.

Not quite as imposing as the Inanda Dam slope, this slope still had a good old frontal drop off that made men and cattle wary. So thermal ships deployed along with BEE wings, and we spent the day sloping the most amazing thermals while waiting for the wind to push.

Late in the day the blow did indeed come through, but the lift still remained scratchy and we saw a few gliders make an unscheduled trip down the front od the slope, to be recovered by the local lads... for a small fee. Come in Kobus, come in!

An early night beckoned the now tiring lads due to the frivolities of the night before, and a well rested crew woke up for the Sunday trip to a slope called Switchblade.

Panoramic is somewhat an understatement for the Natal slopes and this slope was capable of handling a North West through to North, through to North East switch. With the temperature hitting the 30-35 degree mark, suntan lotion was applied in buckets, caps donned and our gliders took to moderate and hot conditions.

While waiting for the eventual switch to the North East we did a bit of BEE wing pylon racing which was duly won by Michel Leusch. Eventually, as the day waned, we saw the wind switch moved the entire crew to the East facing slope. Russell called the event and we were able to carry off a

Opposite page: Kobus contemplates things before giving his V-tail a launch.

Simon launches his one-week-build glider. It performed brilliantly.

Panorama of the Switchblade slope

Ziggy and the yellow BEE

Mark is well... Mark

single round of aerobatics A six in cricket as it were, one shot at it, before the lift failed in the evening light, and which was duly won by Michel Leusch once again...

Congratulations to Russell Conradt for pulling off this event. Yes, Russ, the stress is worth it and those grey hairs will make you look more distinguished.

Hosting an event like this is never easy, but hell, it's worth it!

A huge thanks must go out to all the slope community in Durban. Russell Conradt, Dave Greer, Mark, Ziggi, Johan, the ever smiling Rudi and the ever cheerful Adi, Dean, our flight judge, along with Luke, Kobus, who just never gave up no matter how many times his glider made unscheduled front face landings to be fetched by the locals, Simon and his son Ryan, and any of those awesome souls I may have missed in the line up. And finally Michel, who just whipped our Cappie asses.

To those who missed it... you missed it.

We will be back, I promise you, we will be back!

RCSD

The hardcore crew who lasted right through to the end. Well done one and all!

F5J Under the New FAI Rules

With contributions from Luis Manuel González, Ángel Cristóbal Garcés, Francisco Javier Iglesias Guzman and Richard Frederick Brüning

The Championships were organized by the Club Radiocontrol de Sevilla whose logo is pictured above.

Background

Recently there has been much interest in the new motor glider thermal duration (F5J) rules put out by the International Aeromodelling Commission of FAI (the World Air Sports Federation). The FAI passed the long-awaited rules provisionally earlier this year and, since then, countries have been busily testing them over the summer and now into the fall.[1] In our view, the new rules kick (expletive deleted) and will challenge and enthuse thermal duration fans. This is a story about what we learned during the Spanish National Championships which were held in Seville in October.

But, before getting to the Seville and the Nationals, a few words of background are warranted. Motorized gliders have become increasingly popular here in Spain as interest in F3B and F3J have declined. Their simplicity and user-friendliness have won many converts from F3B and F3J because of their need for cumbersome winches, time consuming organization, and teams of burly men. True, these are fabulous competition categories, but considerable frustration exists when winners and losers are determined by flights that differ by seconds or landings that only differ by centimeters.

Different approaches to F5J

Just being able to go out for a fly and the convenience of motor gliders has allowed the attraction of newcomers and younger pilots to the sport. But, at the same time, there has been a mess of different approaches to motor glider competitions. Since everyone was experimenting, a

1. With all due respect to our readers in the southern hemisphere.

A picture of the Giralda (the cathedral) in beautiful Seville, a reminder of Spain's Islamic past with its combination of Christian and Moorish architecture, a scant 10 kilometers from the competition and a must visit for Spain lovers.[2]

variety of rules emerged. The key challenge has been how to organize a fair competition. Basically two approaches were employed.

Energy limitation was the only approach until recently. The idea was that each pilot was given an equivalent amount of energy (in relation to the weight of the model) to bring his model to soaring height. The amount of power generated by a particular motor/battery/propeller combination was measured with an ampere meter (or ammeter) and a number of seconds of engine time was allocated based on a formula. The implicit goal was to create an even playing field and equalize the starting point of the competition. Unfortunately, in practice, starting heights were typically all over the place and in many cases differed in excess of 50 meters. The energy limitation approach was susceptible to gaming by cooling batteries before measurement, and by transmitter programming, and required expensive motor and ESC combinations.

The next concept was referred to as height limitation. It was made possible by the technological development of cheap and accurate altimeters that could be fitted into models that would cut the engine at a pre-selected soaring height. Height limitation using automatic cutoff by altimeters seemed to be the ideal solution. The idea was that if everyone started at the same height, then the contest would be fair. Considerable experience was gained with altimeters and height limited rules, particularly in the UK, whose rules Spain and other countries used as a reference point.

It is as a result of growing global interest (and just the beginnings of a consensus around the use of altimeters) that the FAI embarked upon developing its new F5J rules. The objective was to propose a first set of international rules that could also be used at national level. The main objectives of the new rules were to: be sufficiently challenging to allow for serious international competition; address the defects of F3J by creating greater opportunities for pilots to differentiate their scores; focus on piloting skills; and reduce to an absolute minimum the potential for gamesmanship and cheating.

The FAI group tasked with developing international rules faced significant challenges in arriving at an agreement. While height limited rules initially appeared to be a point of potential consensus, in the end neither those favoring energy limitation

2. For info on Seville: <http://en.wikipedia.org/wiki/Seville> and <http://www.sevilla111.com/>.

nor height limitation won and something completely new was developed. This article argues that the new F5J rules, now tried and tested in practice here in Spain, France, the UK, Hungary, Slovakia and elsewhere, make for a whopping good competition and will ultimately be a great success.

The new FAI rules:

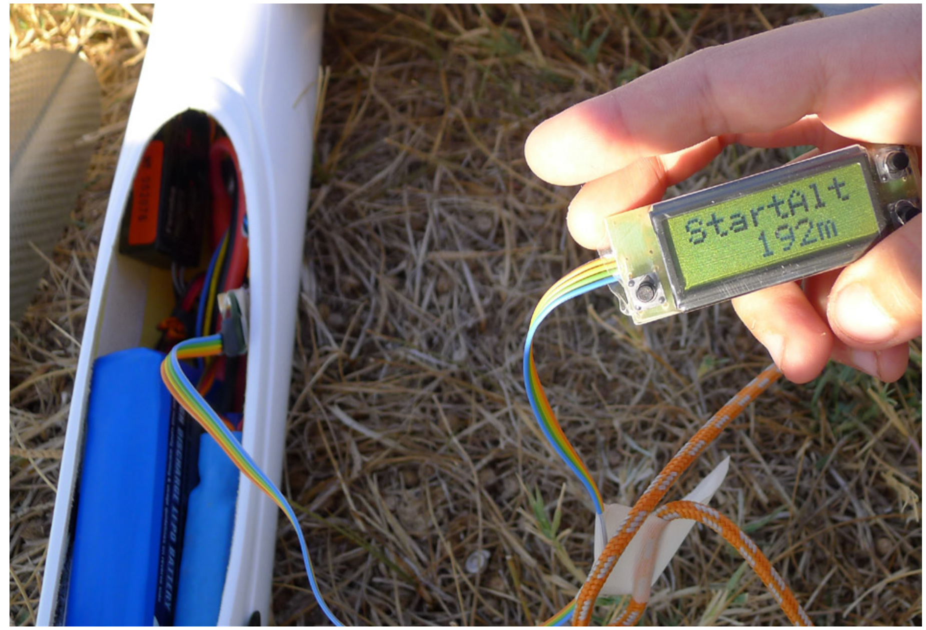
In their most simple form, the FAI F5J rules[3]:

- Are similar to F3J rules with 10 minute flights (15 for fly offs) with one point per second flown, followed by a spot landing
- Allow the competitor to select the height at which he will cut the motor
- Penalize the competitor .5 points for every meter starting height up to 200 meters
- Penalizes the competitor 3 points for every meter starting height over 200 meters
- Provide a landing bonus of 50 points within a radius of 1 meter, descending 5 points per meter down to 10 meters

Now it gets a bit more complicated. In order for these rules to work, the elevation at which the flight begins needs to be measured. More precisely, the FAI starting height is the maximum height between when the model leaves the competitor's hand and 10 seconds after the engine has been cut.[4] This starting height must be read from the altimeter after each and every flight and recorded by the timekeepers (along with the flight time and landing points). The result of these rules is that pilots choose their own height with the most adept fliers cutting their engines lower in order to reduce the climb penalty. In addition, it becomes quite unlikely that competitors will have very close scores.

3. The full set of rules are available at: <http://f5j.eu/w/index.php?title=Eurocup_F5J_%26_F5J-400_Outrunner>

4. This reasoning behind this rule may seem opaque but, essentially, it is designed to prevent competitors from doing a "zoom" i.e. using extremely powerful engines that would allow a rapid ascent, cutting the engine, and then coasting much higher on inertia.



A card reader produced by RC-Electronics in use. FAI start altitude is read on the display. Other options currently being considered for showing FAI start height include LEDs and audible sounds.

For the moment, the only altimeters that are suitable for use in an FAI F5J competition are the RC-Altimeter #2 produced by RC-Electronics[5] and the Altis v3 by AerobTec[6] albeit that neither are officially sanctioned. Other companies produce RC

5. <http://www.rc-electronics.org/>

6. <http://www.rivamodels.sk/F5J-FAI/F5J-FAI_14.html>

Dust devils (whirlwind or mini-tornado) indicated strong thermal activity. The spirals are perfectly visible in the picture. This one was about 20 meters across and rose over 100 meters into the air.

A blue-white Xplorer being launched during a warm up flight.

altimeters and it is hoped that producers will increasingly be motivated to provide high quality altimeters at competitive prices that are FAI F5J compliant. So much for background and rules.

Seville

What happens in practice? The competition for the title of Spanish National Champion in Seville was hot, along with the air temperature that reached 42° C (108° F). Competitors arrived from all over the country the day before the event. The initial warm-up flights immediately suggested that the weather would pose challenges. Winds were blowing at up to 25kms/hour. There were strong thermals but, more impressive, was the sink. One of the authors measured sink of 3.5m/s meters/ second on his data recorder during a warm-up flight. It was clear from the initial flights that there would be plenty of opportunity to soar and

Pouring a cool one at the beer truck. Beer trucks should definitely be mandatory under FAI rules.

Parched ground as the competition starts.

also plenty of opportunity for a face plant for those who did not know when and where to run and hide.

The day of the competition started with higher winds over 35km/h. Some large dust devils kicked up. Meteorological challenges were resolved in the most Andalucían of ways by staying calm and upbeat, and occupying ourselves with food and conversation while waiting for conditions to improve. Everything in the south has its proper pace, so that as the organizational machine of the Club Radio Control Sevilla continued methodically and meticulously with its preparations, the weather became milder, the winds died down and, after a relaxing lunch with occasional visits to the beer truck sponsored by Cruzcampo, the competition started a bit hot, but under but perfect conditions and with everyone in a good humor.

Luis, the master of ceremonies for the Club Radio Control Seville, remains cool.

A launch during the qualifying rounds. Noteworthy is that a one or two second delay in launch has little relevance given differences in point scores.

A mid-air collision between a Pulsar and a Stork caused both to spiral out of control but resulted in only minor damage.

But once the competition started, things were no longer a laughing matter. Some participants were along for the ride, but Seville had drawn together some of Spain's best, and they were clearly going for the gold. The competition for who would get to the fly offs was ferocious.

The qualifying rounds

During the two days of classification flights, meteorological conditions, pilot skill and luck ensured that the scores were very different even within the same round. Of the 187 flights in the qualifying rounds, seven scored zero (principally for landing out), 1/3rd of flights (60) were in excess of 9 minutes, and 48 flights did not reach 5 minutes. The gaps between flight times were thus considerable. Most 1,000 point flights were achieved by cutting the engine below 200 meters though one was scored from 259 meters. The lowest full point flight was flown from 149 meters.

The fly offs

The fly offs were spectacular and marked by both strong thermals and strong sink. In the first round, full times were made fairly easily by almost everyone. Seven of the ten pilots managed to get over 14 minutes each with good landings. Ramón Rizo Aldeguer won the first 1,000 points with Pedro Millan Vela and Pedro Perez Rubio close on his heels. Richard Frederick was notable for his inability to launch his plane because of a problem with a battery plug. He spent 4 minutes on the ground before even beginning his flight.

The 10 qualifying pilots. Given the heat, some would have been happy to call it quits then and there.

But, in the second round Richard staged his comeback with a 14’ 47” flight while the closest competitor flew 7’ 31”. Being poorly placed after the first round, he had decided to take a risk and launch low. The risk and a lucky thermal paid off opening a 574 points gap with the closest competitor. In the overall standings Richard now lead Pedro Millan by 300 points.

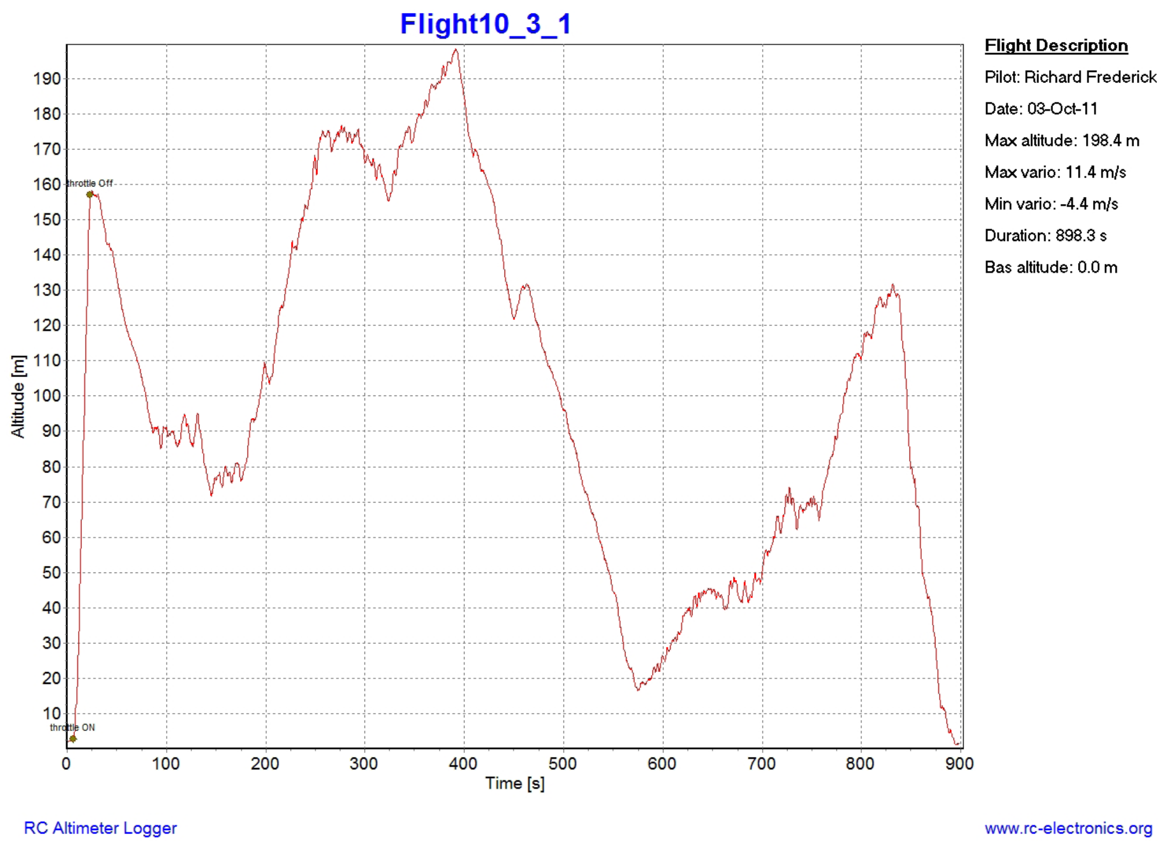
But not for long. Pedro seized the lead in the third flight and turned the standings on their head. He flew an 11’ 15” flight while Richard floundered in sink scoring 3’33”. Angel Cristobal Garcés flew more consistently than most during all of the flights and began to close in on the leaders.

The fourth flight would prove to be decisive. Millan and Richard both launched at 158meters, but the results were manifestly different. Richard logged 14’47” while Millan flew 4’12”. The sink was strong and had forced him to make a hasty landing outside of the landing zone. None of the other pilots made 5 minutes with one exception. Angel Cristobal who fought to the end with a truly masterly flight. Both Angel and Richard eventually achieved almost identical flight times of (14 ‘48 “ and 14’ 47” respectively) but Angel had launched at 203 meters.

The altimeter download from the final fly off flight at left shows what pilots encountered all weekend long: moments of exasperating sink interspersed with moments of glory.

The planes

It is always interesting to see what planes win. Molded airplanes including the Pike Perfect, Xplorer, Electras and Stork were used in Seville. They were expected to perform well especially in the windy conditions. Ribbed planes were very



Richard and Angel had very similar downloads for their final flight. Both initially encountered sink, recovered by finding thermals that they rode to the limits of their eyesight, found sink on the way home, and then recovered from very low altitudes to complete their flights with full flight times.

popular, did well in the overall standings, and logged some excellent flights. Among these, the most popular were the Pulsars which came in all sizes from 4 down to 2.5 meters. Ultimately, a Pike and an Xplorer took the first two spots. The advantage of the molded airplanes appears less due to their efficiency than their ability to run when there is sink, and their ability to range and make a more strategic use of the field. Nevertheless, the flights show that many different planes can win and the ultimate weapon remains to be defined.

Organizational tips

The organization in Seville went perfectly, and the use of the card readers was neither time consuming nor problematic as some had feared. The key success factor was properly-trained judges and the teamwork of timekeepers, judges, assistants, pilots and their assistants. During the pre-flight briefings with timekeepers and judges, precise instructions were given for each phase of the flight (pre-take off, take off, landing, timing, and penalties) with printed copies summarizing the rules for all. Card reader backups were available in the event there should be a failure. The same briefing was conducted for the pilots to make sure that everyone was on the same page.

From June until October, Luis Manuel González and Antonio Pereira from the

Club Radiocontrol de Sevilla undertook the preparatory work. The main organizational challenges were having sufficient judges. In the end, ten young people pay were paid and received training as F5J judges. Three club members also volunteered as possible back-ups. The need for a large number of timekeepers was imposed by the number of participants (initially over 40). For smaller or less formal competitions the number of timekeepers could be decreased or be done by the pilots themselves.

Another success factor is to have a Director of Competition with integrity, who knows the rules and is able to deal with 40 typically strong-minded pilots. This year Paqui Vidal combined the necessary qualities of character, seriousness and hard work. Without harassing contestants, she was able to keep on schedule, and enforce 100% compliance with the FAI rules. In the end there were no disputes or other incidents worth mention to mar the event.

Another key success factor was placing the responsibility for altimeter function on the pilots. While this seemed unfair to some who felt they should not be held responsible for a new and unproven piece of equipment, it was decided that the ultimate responsibility was theirs (the alternative being that the organizers assume responsibility and allow re-flights

Tired but happy. From left to right, Pedro Millan Vela (CR Sevilla) 3rd , Richard Frederick Brüning (Grupo Halcón, Madrid) 1st, and Ángel Cristóbal Garcés (Grupo Halcón, Madrid) 2nd.

Pilots with a wide array of planes.

in case of altimeter failure). As a result of this policy, no re-flies were necessary.

The altimeters

The innovative aspect of FAI F5J competitions is the use of altimeters. Innovation delivers marvels but, it rarely comes without challenges. At a prior competition in Madrid, problems had been experienced with a significant number of altimeters. As a consequence, it was decided to allow competitors to fly with two altimeters and allow readings to be taken from the second in the event that the first failed. Only a handful of contestants took advantage of this opportunity. The issues that arose were relatively minor and can be divided into technical and human failures:

<u>Technical failures</u>:

• One use of a backup altimeter upon failure of primary altimeter with no effect on the competition

• Two uses of a different card reader upon failure of first card reader with no effect on competition

• One case of complete failure of an altimeter yielding a zero flight score. The pilot withdrew from the competition since he had no back up altimeter.

<u>Human failures</u>:

• One disconnection of altimeter from power source yielding a zero flight score. This could have been resolved by using RC-Electronics firmware 0.02 (which had not yet been tested or authorized in Seville).

To give a sense of the frequency of failures, the total number of flights was approximately 200 in the qualifying rounds and 40 for the fly offs.

Pedro Perez hits the mark with his Stork, one of the most maneuverable composite planes around.

Smaller clubs and beginners

Some readers are probably wondering whether they could organize their own contest under the new rules. A number of questions arise: Are the FAI rules only suited for international or large national competitions? Can a smaller club successfully organize a FAI compliant event? Can less experienced pilots compete under and enjoy a competition under the FAI rules? Opinions here in Spain differ.

However, in general, the consensus appears to be that smaller clubs are capable of organizing such competitions. FAI rules are really not that much more complicated than older energy limitation rules which required repeated measurement of the plane's power system with ammeters. Some of the complexity of a FAI F5J event is simply due to the fact that the rules are new and that no one has much experience with them.

Even if the clubs are able to organize events, FAI rules are probably not suited for beginners. Height-limited competitions are in many ways the simplest form of contest, and continue to be a fun and attractive way to compete especially for new pilots. They may be a way for beginning pilots to start into thermal duration events. The drawback is that new pilots need to invest in altimeters. This may be something

A well-informed (and attractive) team of judges is fundamental to the success of any event.

clubs can address by providing altimeters to participants, or offering their use for free until they decide to buy them.

Conclusion

In conclusion, we would like to thank the FAI for developing this highly promising formula. The rules derive from but are a vast improvement over F3J. Differences between scores are significant and the competition has interesting new strategic elements. For one, deciding and judging the height to cut off the engine requires strategy, training and intuition. And, the 15 minute fly offs mean that the competition can stay wide open until the fat lady sings.

Some participants now see this set of rules as the future for motor glider thermal duration contests—not least because they focus on flying skills over expensive motor setups. Certainly it is the only set of rules that allows us to compete internationally. Like all things new, they may require tweaking. But mainly, attention needs to be paid to truly perfecting the performance of altimeters. With this small word of caution, we're fully behind the new rules and would like to encourage other countries and clubs to give it a try and enjoy.

Comments and questions in Spanish are welcome at: <luis_gonz(at)hotmail.com>

Comments and questions in English are welcome at: <RichardFrederickDC84(at)yahoo.com>

For more on F5J in Spain see: <http://f5j.es/>

RCSD

LIFT ON THE WING

Ferdinando Galè, ferdigale@alice.it

When one starts designing a new flying model, often one is tempted to make some practical aerodynamic considerations, using limited and incomplete information, which are commonly available to model builders.

Once an airfoil and the related incidence have been selected, one can reckon the flying speed according to his experience and to the type of model.

By doing so one determines an acceptable lift coefficient CL. This remains constant along the wing span, if the incidence remains constant.

Therefore, if one imagines to divide the entire wing into “slices” (may be of equal width), one can arrive to the conclusion that each “slice” produces an amount of lift strictly proportional to its area.

The sum of all these little amounts of lift is identical to the weight of the model, when flying at the above mentioned speed.

This is what one learns from any book on applied aerodynamics.

This is also the assumption that one makes, when calculating the structures of any aerodyne, whether flying model or man-carrying aircraft.

Almost always the airfoil is thinned and the incidence reduced (may be 0°) towards the end of the semispan s, in an attempt (or illusion) to minimize the end vortices and the related induced drag.

All above is quite appealing, but quite different from the truth.

The conclusion that the lift is strictly proportional to the area of each “slice” is true only for a wing of infinite aspect ratio ($AR = \infty$). Such a wing is only a theoretical abstraction, which does not exist in practice.

All the reasoning that follows is base on some correspondence that I exchanged with Dr.Reimar Horten in Argentina, where he lived (an died) after the end of WW II°. Reimar and his brother Walter had realized in Germany about one hundred of tailless flying models (free flight, of course, since radioguidance had not introduced to the model world).

Then they designed man carrying aerodynes of many types: several hundred had been built by them and by others (including Russians).

Luckily for the Allied, the war ended before the construction was started of a six jet tailless bomber they had designed, in order to bomb New York.

This project had been approved by Goering.

The Horten brothers had quickly realized the practical validity of many studies by several German researchers, such as Prandtl, Lippisch, Multhopp, Schrenk, Weissinger and others.

The Horten brothers were the first ones to adopt the principle of the bell shaped lift distribution along the wing span, although it is not historically confirmed that they had invented it.

All above explains why I have confidence in the Horten principle; it has also prompted me to write this note for my friends aeromodellers.

Having adopted the concept of the bell shaped lift distribution for their tailless aerodynes, the Horten brothers were very attentive to the actual lift distribution along the wing span. In this respect they adopted the procedure developed by the German researcher Oskar Schrenk in the '30s of the last century. The report by Schrenk (Ref.8), has been translated also in English (NACA TM 948 – "A simple approximation method for obtaining the span-wise lift distribution").

There are several other methods of calculation; some of them are listed in the References. In all cases, the results are almost identical, at least as far as the precision required for the model building activity.

As an example, just think at the angles of incidence, which exist only on the building plans: who has ever used a professional clinometer (may be of the electronic type), in order to verify the angles of attack of wing and stabilizer?

Upon Horten's suggestion the Schrenk method is still used by builders of amateurial aerodynes (both aeroplane and flying models), not only in Germany. Such a method is useful for us model builders, inasmuch as it does not require elaborated mathematical calculations, such as derivatives, integrals and the alike. Many model builders are not familiar with them.

Let see quickly what we are talking about.

Only the elliptical planform ensures the elliptic lift distribution at all angles of incidence, provided such incidence is constant from root to tip. The lift along the semispan deviates from the elliptic one, if the wing planform deviates from the elliptic shape.

These considerations are the foundation of Schrenk's reasoning, in order to obtain the local lift coefficient at any distance from the wing root.

It is common practice to take in consideration a lift coefficient CL = 1; to this one are related the actual values of the adopted airfoil.

The lift at any point of the wing semi-span is given by the relation

$$CL \bullet c = ½ [c + K \bullet \sqrt{(1 - (y_n / s)^2)}] \quad (1)$$

In this formula the symbols indicate

CL = lift coefficient
c = local chord, cm
S = wing area, dm^2
b = wing span, cm
s = semi-span = b/2, cm
c_m = average chord, cm
y_n = distance from wing root, cm
K = (4 • S) : (π • b)

The factor K depends only on the wing geometric measurements.

Incidentally, the expression under the square root represents the "chord" of an ellipse.

The value calculated with the formula (1) divided by the local chord c gives the local lift coefficient.

Let's make a practical example of the Schrenk method, using also the following table, in order to speed up the calculations:

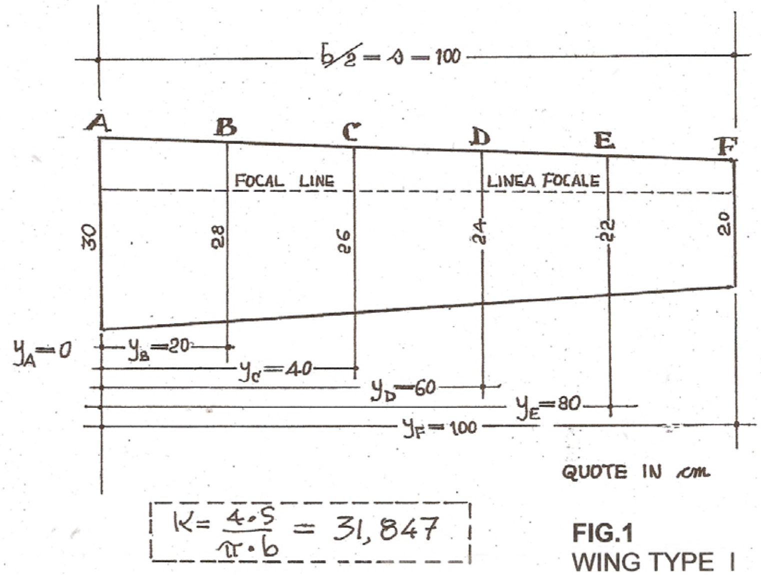


FIG.1
WING TYPE I

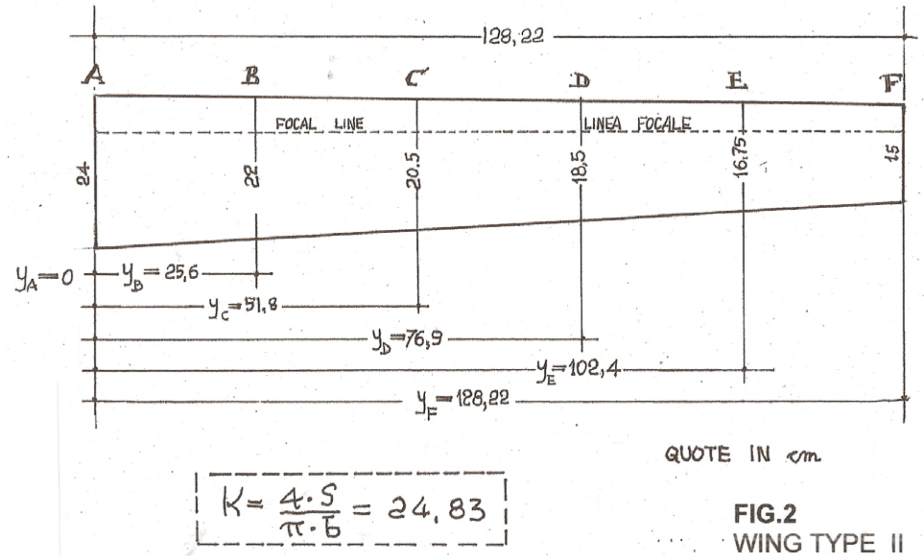


FIG.2
WING TYPE II

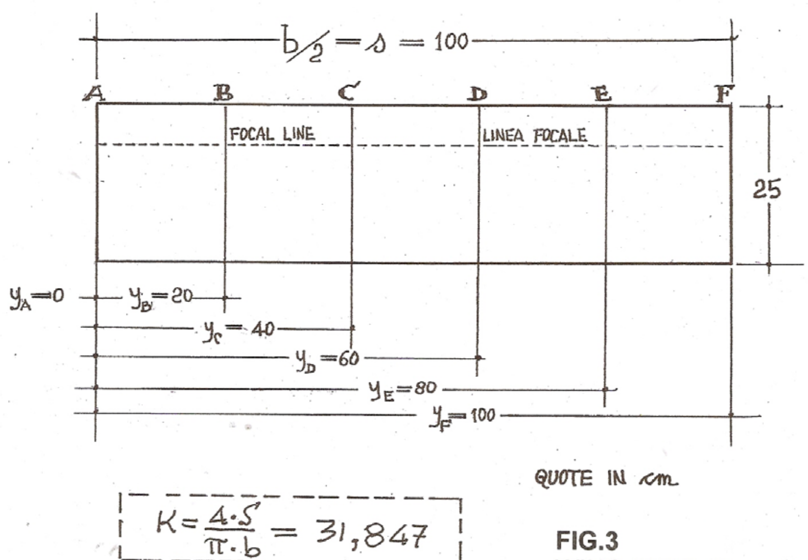


FIG.3
WING TYPE III

Points Y_n (s)	$\sqrt{(1 - (y/s)^2)}$
0,0	1,000
0,2	0,980
0,4	0.917
0,6	0,800
0,8	0,600
0,9	0,436
0,95	0,311
0,975	0,211
1,000	0,000

Six stations along the semispan are taken into consideration: they are indicated with the letters A, B, C, D, E, F in the attached sketches.

As already mentioned, these calculations are made for CL = 1.

For values different from CL = 1, the results must be multiplied by the ratio of the two CL values.

Let's consider the semi-spans of three possible flying models, Type I, Type II and Type III: see FIG.1, 2, 3.

The tip chord F is – in practice – the last rib before the tip terminal (usually with a rounded shape), which has been omitted in the sketches for sake of clarity.

Their specifications are as follows:

WING TYPE I

	y	c	k	s	CL
YA	0	30	31,847	100	1,030783333
YB	20	28	31,847	100	1,057206427
YC	40	26	31,847	100	1,061312647
YD	60	24	31,847	100	1,030783333
YE	80	22	31,847	100	0,934277273
YF	100	20	32,847	100	0,5
				Average CLa--------->	0,936

WING TYPE II

	y	c	k	s	CL
YA	0	20	24,84	128,2	1,121
YB	25,6	22	24,84	128,2	1,053175246
YC	51,8	20,5	24,84	128,2	1,054195049
YD	76,9	18,5	24,84	128,2	1,037159616
YE	102,4	16,75	24,84	128,2	0,946126749
YF	128,2	15	24,84	128,2	0,5
				Average CLa --------->	0,952

WING TYPE III

	y	c	k	s	CL
YA	0	25	31,847	100	1,13694
YB	20	25	31,847	100	1,124071199
YC	40	25	31,847	100	1,083765153
YD	60	25	31,847	100	1,009552
YE	80	25	31,847	100	0,882164
YF	100	25	31,847	100	0,5
				Average CLa ----->	0,956

NOTES:

YA, YB, etc. =% distance from wing centreline

c = chord in cm.

s = semi-span in cm.

CL = lift coefficient

CLa = average lift coefficient

S = wing area 50 dm^2

TABLE 1

EXCEL SPREAD SHEET

			[I]	[II]	[III]
Wing area	S	dm^2	50	50	50
Wing span	b	cm	200	256.4	200
Average chord	c_m	cm	25	19.5	25
Aspect ratio	AR	b/c_m	8	13.1	8
Wing loading	W/S	g/dm^2	40	40	40
Taper ratio	T/R		0.66	0.625	1.00
$K = (4 \bullet S) : (\pi \bullet b)$			31.847	24.83	31.847

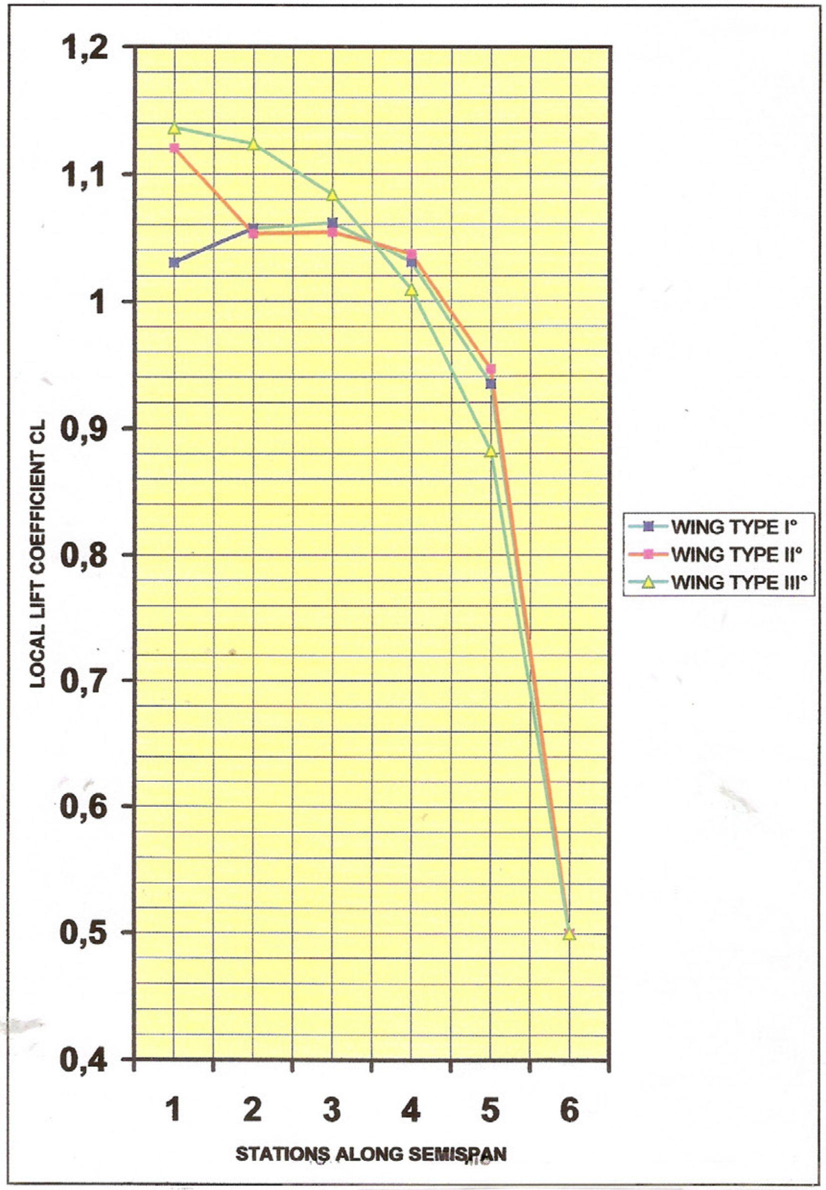


FIG.4
LOCAL LIFT COEFFICIENTS

The relevant calculations, even if made with a pocket calculator are tedious and time consuming: one is much better off by using an Excel spread sheet (TABLE 1), which should be interpreted as follows.

Under the heading CL one finds the lift coefficient at the various stations along the semispan, (they are listed in the light blue column at the left).

For each wing type the average lift coefficient is indicated as CLa in the yellow cells. FIG. 4 shows the variation of the lift coefficient along the wing semispan. Of course the accuracy improves by increasing the number of stations taken into consideration.

At this point we can draw some indications:

a) quite contrary to our logical (?) expectations, the lift coefficient does not remain constant along the semi-span. In any case its value is lower than the original value;

b) in a rectangular planform, the lift coefficient is "emphasized" at the wing centerline, while in tapered wings such increase happens at about 30% of the wing semi-span (from the root, of course).

It is common practice to take into consideration the aerodynamic efficiency E of the airfoil, that is the ratio of lift to drag (or the ratio of the relevant coefficients)

$$E = L : D = CL : CD \qquad (2)$$

For the above examples a value CL = 1 has been adopted; now if we assume CD = 0,05 (which is quite an expectable value), the following values are obtained:

[I]	E = 0,936 : 0,05 = 18,72
[II]	E = 0,932 : 0,05 = 19,05
[III]	E = 0,956 : 0.05 = 19,12

Practical values could be even worse, because there is also a drag increase, according to Prandtl's teachings. This has not been taken into consideration in this paper.

A similar surprise can be expected if one determines the power factor W.

Its maximum value ensured the minimum sink speed Vy.

Any text book tells us that this factor is given by the formula

$$W = CL^3 : CD^2 = E^2 \bullet CL \qquad (3)$$

For the original airfoil one finds $W = E^2 \bullet CL = 20$, while for our three wings one gets

[I]	W = 18,75 • 0,936 = 17,55
[II]	W = 19,05 • 0,935 = 17,81
[III]	W = 19,11 • 0,956 = 18,27

Also here the numbers are growing worse.

The same worsening one will find, for instance, when applying the above consideration to the formula which gives the sinking speed

$$Vy = 4 \bullet \sqrt{[(Q : S) \bullet (CD^2 : CL^3)]} \qquad (4)$$

In this relation Q : S is just the wing loading.

Conclusion: Although aerodynamic calculations are of limited importance in the normal aeromodelling activity, it is advisable to use corrected values for the relevant coefficients if a minimum dependability is the target. This avoids the inaccuracy which develops when only the values of the original airfoil are taken into considerations.

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I love flying in the Eastern Soaring League

Ed Anderson, aeajr@optonline.net

I enjoy contest flying, but this is not about how to win contests. This will be about why I enjoy contest flying in the Eastern Soaring League. I know some of you have already started to balk because the word contest has appeared. But hang on a moment and let me try to win you over.

What I love about flying in the Eastern Soaring League are the people I have gotten to know. More than anything else it is the people that keep me active in the ESL. I certainly enjoy flying club contests, but what the ESL adds over club contests is exposure to a much larger part of the soaring community with a full range of talent and experience. And that larger community is not a world away, or a once a year big event type of thing, it is made up of people who I will see again and again over the course of the season. I get a chance to know both the developing pilots and the masters of the sky.

The ESL contests are AMA sanctioned events and are flown within AMA guidelines, but each contest and each field has a unique character. Each CD runs the contest a little differently so it keeps things interesting.

It is such a kick to read an article about some world class soaring competition, looking over the pilot list and knowing that I have flown with some of those pilots, and probably more than once. Some of these guys taught me how to time a flight. They taught me how to read the ribbon on my antenna. They gave me personal coaching on landing. They helped me tune my airplane. This is like having Derrick Jeter teach you how to field a ground ball or Tiger Woods showing you the fine details of a chip shot.

Whether it is an ESL contest at our club field or an away contest, it is the pilots that draw me to the contests. These are some of the best people I have ever met. To be surrounded by people who share my love of soaring is a wonderful experience. Getting to see and fly with them at various fields throughout the season takes this beyond attending a single large event like the Nats.

Many times the host club will open up the flying field for practice the day before the contest. The ESL pilots start to show up on Friday to tune their planes, refine their launches or just enjoying the sky and get to know the field. At the last contest I attended there were pilots who set-up an F3J winch to practice for a team selection event later this year. Why do this at an ESL event? Because they come from different clubs and different areas but they come together at ESL contests many times each season.

I had never seen F3J style launches in person so it was fascinating to see the difference in launch technique used for this similar but different type of flying. They were working on a sub one second launch. Talk about wing flex! Maybe I will give F3J a try some day.

Another pilot had his Cross Country glider there on Friday. This is a monster big plane with a huge wing span. He and others were talking about cross country

ESL contest hosted at the SKSS field in Delaware. Photo by AMA Natonal RES Champion Pete Schlitzkus

events. In fact he flew this monster in the last round of the contest on Sunday. It made the other planes look tiny by comparison. Perhaps I should think about trying cross country flying.

The key is that none of these pilots were from my home club. These are people I would not have met had I not been flying in the ESL. Watching them and speaking with them has caused me to give real consideration to trying these other forms of soaring some day because I know that I have friends in the ESL to turn to for help and advice.

The ESL also encourages pilots to participate in the League of Silent Flight task program. ESL has added LSF points calculations to the scoring system so pilots can just read the LSF points for the contest right off the end of day results.

Since each contest counts toward a season standing, my interest is kept high all season. I can watch the leader board on the ESL web site and see how

Sportsman Mike Lavelle with his home built Bubble Dancer after a good flight. Photo by Hedil Katramatos

my friends are doing. Since the ESL web site shows who is registered for each contest. This can help when arranging travel buddies or hotel sharing for away contests. I have even brought planes or equipment to the contest to act as a go between for two pilots who live far apart.

Over the course of a season you see how pilots improve. We have pilots as young as ten and I guess we may have pilots in their eighties. The great thing is that the youngsters, usually there with their Dads, are treated as pilots, just like the adults. Many move through sportsman into expert pretty quickly.

Sometimes a pilot, who has flown with me at various contests, will spot something that I am doing that is holding me back. Even though I am flying against him in the contest he freely offers advice and coaching. I am free to take it or not but it is always given in the spirit of friendship. These small tips can make a huge difference.

I am really impressed with the willingness of ESL pilots to help new pilots as well as experienced pilots. I have watched Novice or Sportsman pilots show up at a contest, nervous and a little tentative. But the ESL pilots truly embrace the opportunity to help the new guys. Very often an informal teaming up will occur and the Novice is no longer alone. One or more of the ESL pilots will take the Novice under their wing, setting up a timing team; you time for me and I will time for you. They will offer gentle coaching while the Novice is flying. There is no better learning experience for a relatively new soaring pilot or a pilot that has limited contest experience. They will help you launch your plane or help you trim it out.

Typically after Friday practice or the Saturday contest there are dinner gatherings. From what I have seen these are highly inclusive. The word is passed and anyone who wishes to attend can do so. Over dinner the day’s contest is discussed, stories of past glories and plans for the next contest winning plane are tossed around. There is lots of laughter and frequently too much to eat.

When I tell people about what I fly, gliders, and we get past the discussion about how they fly and how they are launched, we turn to the discussion of competition. I can’t help it because I love the contests.

The next question is always, “do you win a lot?” They are often surprised when I say I do not win a lot. In fact sometimes I finish dead last. But even at those contests I have a wonderful time.

Sometimes I fly badly on Saturday only to come back and fly great on Sunday.

Each contest offers so many opportunities to learn about flying, about winches, about scoring, about reading the air, contest coordination, aircraft, about everything related to soaring. If you want to know about a particular radio, you will probably find it at the field. Ask someone what they think in May. Then you can ask them again in June, July, August, September and October if you fly with them again. By the end of the season you will know if this is a good radio for you AND you will know someone who can help you set it up.

As you would expect in soaring competition league, there are a large number of high end molded gliders. But there are also quite a few home built gliders. At a recent contest I saw a Bird of Time that was being flown quite masterfully, a Merlin that was doing well and an expert class pilot flying a Magic. Scratch built Bubble Dancers are common. The Supra, Mantis, Aegea and

ESL Pilot John Marien, center, shows the Ascendant XC glider he designed which he flew in the last round of an ESL contest. Dave Beach is left and Tom Broski is right.

Pilots and timers at the winches awaiting for the CD's launch command in a man on man launch format. Photo by Rudi Oudshoorn

Thermal Dancer are popular bagged wing models seen at the ESL contests.

Unfortunately I have seen planes damaged. Occasionally the damage has been so bad that I thought the glider unrepairable. But at the next contest that same plane is going up the winch like it never happened. I have learned about how those repairs are done and have used some of those techniques myself. That is an education that can be worth a lot of money over a lifetime of flying.

When you take the time to talk to the pilots at the contests you see they are from all walks of life. Each has their own story. Just this past weekend we discussed keeping F18s in service, how award plaques are made and I learned a little about how the FAA makes new rules. We talked about kids and families and the state of the economy. I think there have even been a few jobs found through contacts made in the ESL.

While there were 9 TD contest weekends on the ESL schedule, 18 contests in all, you don't have to fly them all to be in the running for end of season awards. Your top 6 contest scores are used. Many pilots only fly the ESL contests at their home field. Perhaps the following season they might venture out to one or two contest weekends that are nearby. If you fly 6 contests out of the 18, you get your 6 scores. But if you fly more you can replace a poorer score with a better one, so the emphasis is on participation. A bad day's score can be wiped away with a better score. As I look at the season progress my goal is to replace those lower scores if I can. This year I flew five ESL weekends, 10 contests, so my best 6 count toward the season standings.

The ESL has two classes, Expert and Sportsman where contest scores are carried throughout the season for end of season standing. There is also a Novice program for the new contest pilot. Novice scores are only counted for the day of the contest. Many Novice pilots move quickly into Sportsman, once they get past the initial nervous experience of being at a big contest. Many need help launching on the winch and many avoid the landing area till they get used to the traffic that can occur around the tapes.

When I was flying Sportsman I took home my share of trophies as well as end of season awards. However this year I moved myself up to Expert class in the Thermal Duration Division. I knew by moving to Expert I pretty much had kissed goodbye any awards for a long time, but it didn't really matter. My goal was to challenge myself to fly with the best, to motivate myself to do better, to develop my skills and someday, perhaps, be good enough to win another of those awards.

You can imagine how excited I was when I finished fourth among the experts at one of the contests. No trophy but I was definitely in lift all the way home. To think that I could fly at that level among these pilots whom I respect, the very pilots who

Expert Pilot David Ashinsky, blue hat, helps Novice pilot Trevor Ignatosky during a contest. Photo by Rudi Oudshoorn.

have taken the time to teach me their secrets. If not for flying the ESL I would not likely have had that experience.

Of course these are contests and there are winners and losers. Don't think I am talking about some mushy love-in. People come to fly their best and would love to win, but most don't and know they are not likely to win, yet still they come, because of the people.

Despite being a competition you see helping hands offered everywhere. At one contest, my first away contest, I had a servo fail and thought I would have to drop out of the contest. The tools I needed to fix it were at home and I did not have a back-up plane. But as soon as people learned I was having a problem and might drop out, they descended on me like a MASH unit. My problem was diagnosed and repaired and I was up to fly again without missing a round. I could never have done that on my own, at that point in my development, but I learned a lot watching them speed fix my plane.

I have been flying model aircraft for about nine years. I started on small electric airplanes but rapidly moved in the direction of thermal duration gliders. I just love the idea of flying based on the energy in the air rather than in the fuel tank or the motor battery. Like Luke Skywalker, we glider guiders use the "force."

In the Eastern Soaring League I have found an experience that I thoroughly enjoy. If you are a TD pilot on or near the East coast, you may want to check out the ESL schedule at www.flyesl.com to see if one of the contests is near enough to give it a try. And if you are a hand launched glider pilot there is an ESL division for that too. I also fly a couple of HL contests each year.

If you do decide to try an ESL contest, drop me a note at aeajr@optionline.net . Perhaps it will be one of the contests I will be attending too. I would love to meet you, learn from you, share what I have learned, and talk about something that we both enjoy, soaring!

Clear skies and safe flying!

Tony Guide and David Beach make an on-field winch repair while CD John Hauff watches. Photo by Rudi Oudshoorn