

Radio Controlled Soaring Digest

November 2015

Vol. 32, No. 11



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Front cover: Al Clark's 1:3 scale Cherokee RM is towed aloft on its maiden flight. The sixth and final installment of Al's Cherokee RM build log is in this issue beginning on page 4. Nikon D3100, ISO 100, 1/320 sec., f9.0, 86.0 mm

4 Cherokee RM in 1:3 scale, Part 6

The sixth and final installment of Al Clark's build log for his 1:3 scale Cherokee RM.

20 TOSS Aerobatic Rules 2016

All of the maneuvers required of entrants in the annual Two Oceans Slope Soarers aerobatic event to be held next year. Worth a look, even if you cannot attend.

27 Eddie the Eagle

Raptor research is being carried out in South Africa with the help of this radio controlled "bird." Kevin Farr details the build, the current state of the research, and plans for the future.

Pipettes and Palette Knives 41

Chuck Anderson explains how to modify those disposable plastic pipettes for use with various adhesives and the benefits of palette knives.

A Voltage Limiter for 2S LiFe Rx Packs 44

Ralf Fuchs of Two Oceans Slope Soarers provides a simple circuit to limit 2S LiFe receiver pack voltage to 6V.

CEWAMS Timberwolf redeaux 45

A sometimes humorous travelogue by Philip Randolph.

Back cover: From the 1st Annual Wilson Fall Fun Fly (WF3) at Wilson Lake, Kansas, the same location as the annual mid-May Midwest Slope Challenge. 15 pilots showed up from as far as central New York and Houston. The picture is of Chance Cooper, Joe Chovan, Mike Bailey and Darren Ammon flying warbirds at the "German Cave" north of Russell, Kansas. It's a great slope for SW winds. October 10 photo by Greg Hine. Canon PowerShot SX280 HS, ISO 80, 1/1000 sec., f4.0

*Background photo courtesy of Steve Holmes
Taken at 38,000' above Pullman, Washington*

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In the Air

The US Department of Transportation (USDOT) Secretary Anthony Foxx announced today (19 October 2015) that drones in the United States will soon require federal registration. As the FAA is still working on a new legal framework for the operation of drones, the registration requirement is an effort to introduce a level of accountability to those flying their aircraft irresponsibly. Due to report on November 20, a task force made up of 25 to 30 representatives from the Association for Unmanned Vehicle Systems International, Academy of Model Aeronautics, Air Line Pilots Association, and others will draw up an advisory list as to which unmanned aircraft should be exempt from regulation (such as toys and small drones), how the registration process can be streamlined, and safety recommendations where appropriate.

The same day, Dave Mathewson, executive director of the Academy of Model Aeronautics (AMA), released the following ...

"Registration of UAS that meet an appropriate threshold of weight, capability and other safety-related characteristics makes sense, but it should not become a prohibitive burden for recreational users who fly for fun and educational purposes and who have operated harmoniously within our communities for decades."

It would seem as though the AMA affiliation with the NAA (National Aeronautics Association), and hence with the FAI, might allow the AMA to exert sufficient influence to result in a reasonable regulatory framework for drones. Hopefully this "registration" will apply only to those platforms (rotary or fixed wing) which are capable of autonomous flight and/or have FPV capability, and not impinge on competitive and non-competitive RC soaring enthusiasts following AMA and/or FAI rules and advisories.

Time to build another sailplane!

Construction log

1:3 CHEROKEE RM, PART 6

Edited from <<http://www.rcgroups.com/forums/showthread.php?t=2127351>>

Al Clark, hotdogx@knology.net

Covering is finished - ready for test flight

The covering is Solartex and I also used Poly-Tak on the seams since I've had trouble with the seams popping loose in places on my Scheibe SF-28A.

I thought about clear-coating the Solartex, but the humidity is just too high right now, causing clear-coat to blush. I might clear-coat it later if I get in the mood, but it's not a necessity. The clear-coat just makes it pick up dirt less and makes it easier to clean dirt off.

N numbers are also Solartex, and I made the Cherokee RM decals under the canopy.

Cockpit interior is Poly-U with stain mixed in.

This was a big project, but then it's a lot of sailplane.





I was hoping for some sunshine today for photos, but by 4:30 PM it was apparent we weren't going to get any, so I shot a few pix anyhow.

Test flight will be this Sunday (14th) after lunch, with Tim Batt and his huge 170cc Decathlon doing the honours.

I have set the CG at 30% MAC to start out, and might be able to move it back a bit after I do a few dive tests.

Not a lot of nose weight was required - 14 ozs in the nose and another 5.4 ozs in an adjustable weight box.









Final weight ended up at 16.2 lbs, a little less than I expected. Wing loading is 19.3 oz/sq ft - very light for 1/3 scale.

Of course wing cube loading is a better indicator, so I compared my model to the full scale RM. The full scale has a wing cube loading of 7.3 oz/cu ft, and the model RM has a wing cube loading of 5.3 oz/cu ft, so the model will be a bit of a floater compared to the full scale.

Hopefully I will have a few in-flight pix to post after Sunday's test flight. I'm looking forward to seeing how she flies!









George Rittenhouse holds the wing tip for the maiden flight.



Photo by John Mears

Cherokee RM maiden flight

Took a few photos of the maiden this afternoon at Epps field. I'll let AI post a detailed description of the flights, but all I can say is that it is one fantastic flying bird. - John Mears

Test Flight Report

I'm happy to report the test flying session this afternoon went perfectly. I got lucky and not one click of trim was required on any axis.

The RM has a lower sink rate and better L/D than I expected, and really climbs well in lift.

It is a smooth flier and tows well just like the 1/4 scale Cherokee II does.

The HQ35xx airfoil sections work well with no tip stalling issues even though there is no washout in the wings. Of course this is what the famous Chris Williams has told me about this airfoil family, but I had to experience it for myself!

Roll rate is decent and rolls are no problem. She does nice loops and hammerheads as well. Forgot to spin her today - will try that next time out.

A few dive tests resulted in a slow pull-up at just about the rate I prefer for a scale bird, so I will leave the balance point where it is at 30% MAC.

Control throws were all OK except I ended up backing off a bit on the rudder mixing with ailerons - she didn't need quite as much rudder as I expected.



On the landing approach. The red shows up well at altitude.



Spoilers out for an easy approach.



Photo by John Mears

Spoilers are effective and she is easy to land smoothly.

Tim Batt provided the tows with his Hemple 38% Decathlon running a 170cc DLE engine - a lot of tug for the RM with 85 lbs static thrust! The big Decathlon pulled the RM along at a good clip, and every time I released I gained another 200 feet after release - the RM was really cooking behind Tim's big bird.

Thanks to my long time flying buddies John Chapman, Mark McCutcheon, and Ron West, who all came out to watch and shoot photos. Thanks to John Mears who came all the way from Birmingham (100 miles!) to watch and take photos. John Mears is the owner of my former 1/4 scale Cherokee II.

Thanks to the bunch of NARCA fliers who all came by to watch the maiden flight

and offer encouraging words. And thanks to my wife Kimberly for coming out to watch.

John Chapman also shot a bit of video. See the video URLs at the end of this installment.

It was a satisfying day and it's great to have the RM all ready to go for our big Huntsville Aerotow Event. Now I can take a break from building for a while!



*Tim Batt (R) shaking hands with author/
builder Al Clark (L) after the maiden flight.*

I have made the 1/3 scale Cherokee RM plans (sample on pp. 18-19) available for free:
<http://www.rcgroups.com/forums/showthread.php?t=2246733>

Also, the wood list is available here:

<http://www.rcgroups.com/forums/showthread.php?t=2246779>

Maiden flight videos at:

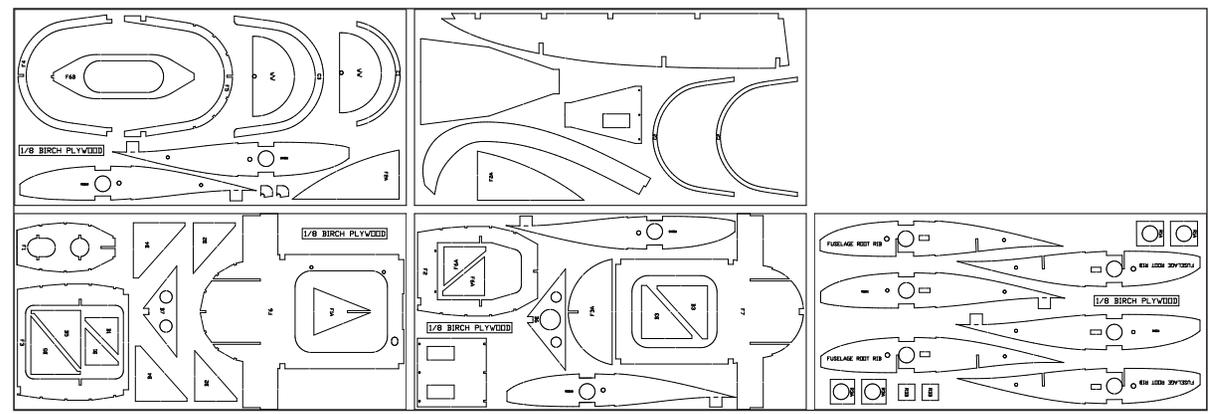
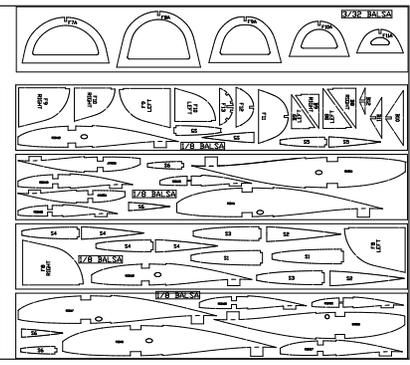
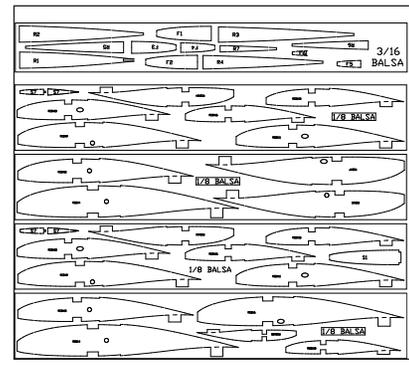
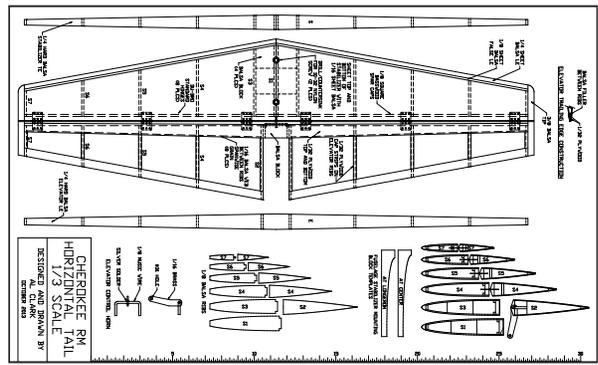
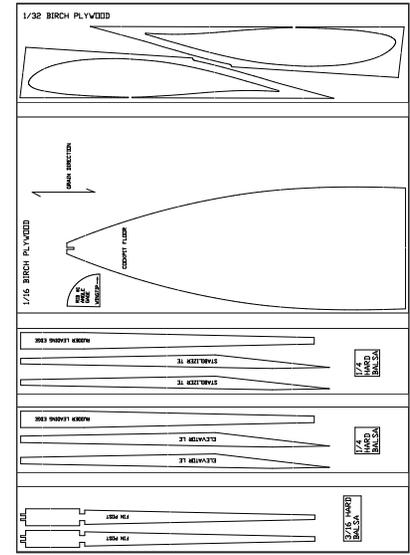
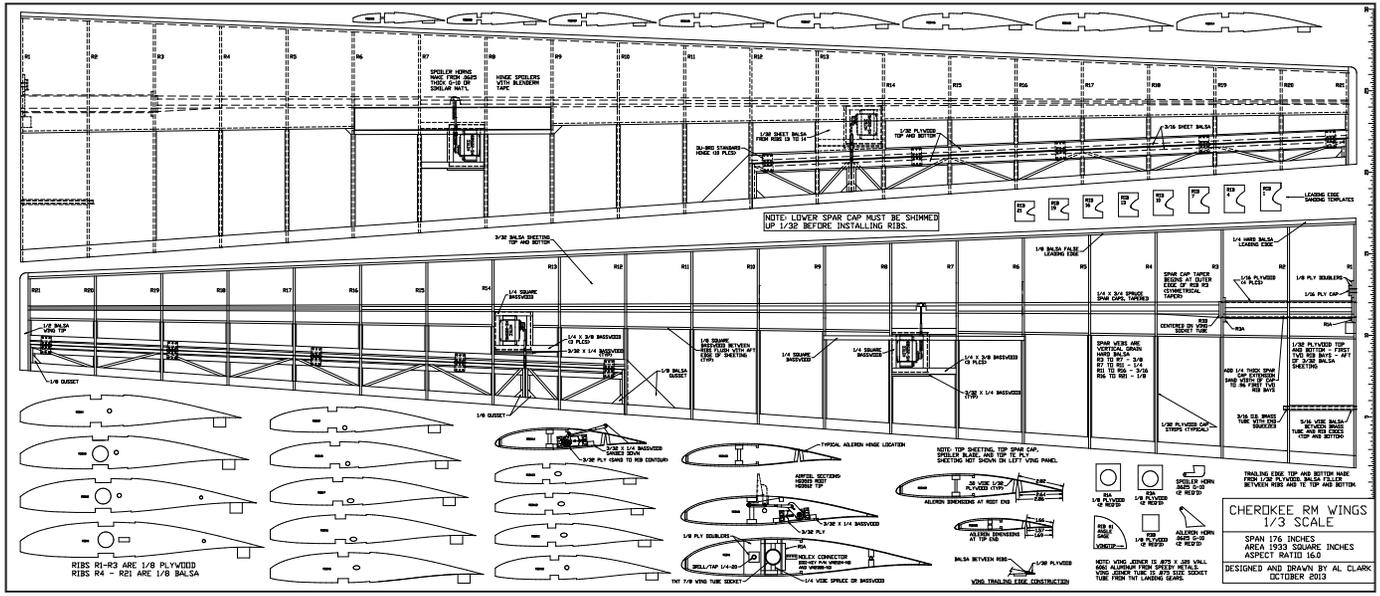
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<<https://www.youtube.com/watch?v=eqI5H2MDsHE>>

<<https://www.youtube.com/watch?v=JHaPDInvgpl>>

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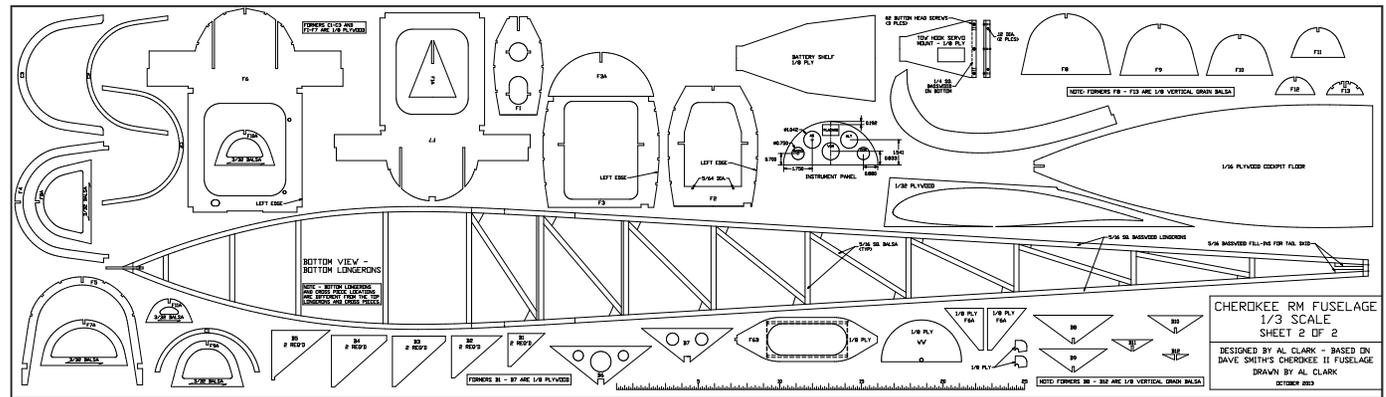
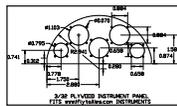
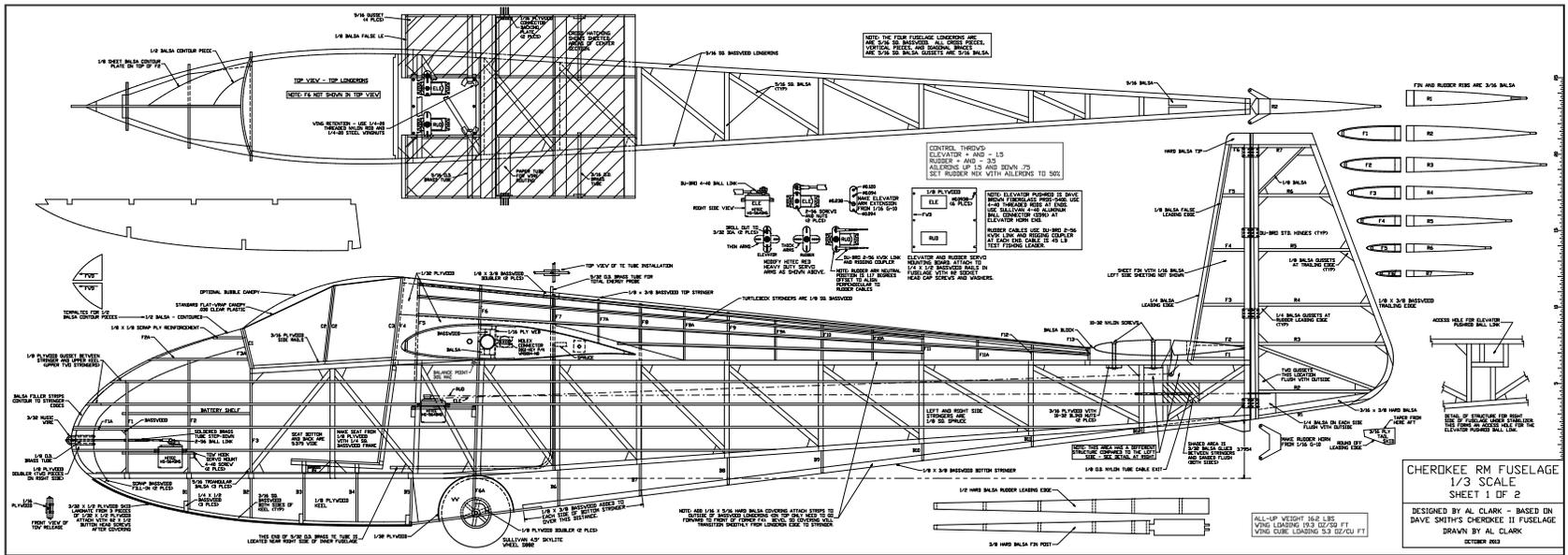


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Two Oceans Slope Soarers

Aerobatic Event Rules 2016

1. **GENERAL RULES for 2016** **“PLEASE NOTE, THESE RULES WILL APPLY TO THE SCORES COMPETITORS ATTAINED DURING THE 2015 COMPETITION”**
 - a. The purpose of the event is to fly aerobatic manoeuvres with a radio controlled glider with no means of powered flight and without any stability control electronic aids.
 - b. A round will consist of ten individual manoeuvres with the lowest scoring manoeuvre being deleted.
 - c. The competition will consist of as many rounds as the weather will allow.
 - d. Only the match director shall decide if the weather is suitable to attempt a round of flying.
 - e. Once a competitor has handed in his score sheet to the judges, it may not be retrieved to alter the selected manoeuvres.
2. **THE EVENT SHALL CONSIST OF THREE FLYING CLASSES**
 - a. “OPEN CLASS”
 - b. “SCALE GLIDER CLASS”
 - c. “EXPERT CLASS”
3. Competitors entering for the first time may enter any one of the above classes
4. Any competitor who has flown in the 2015 “Sportsman Class”, may elect to move up to the “Expert Class”
5. Any competitor who has flown in the 2015 “Sportsman Class” and fulfils all of the following three criteria, will be required to move up to the “Expert Class”.
 - a. Finished 1st overall in 2015 “Sportsman Class”.
 - b. Must have attained an average of 60% or more of the “non-factored” score of their selected “Optional Manoeuvres”
 - c. Must have selected “Optional Manoeuvres” with an average K-Factor greater than the average K-Factor of the available “Optional Manoeuvres”.
6. Any competitor who has flown in the “Expert Class” may only elect to move down to the “Open Class” if he/she meets all of the following criteria: -
 - a. Competitor has scored 40% or less of the non-factored score.
 - b. The average K-Factor of the manoeuvres the competitor has chosen were less than the average K-Factor of available manoeuvres
7. **THE SCALE GLIDER CLASS**
 - a. This class shall only be hosted if three or more entrants fly the competition.
 - b. The Scale Glider Class competitor shall choose any ten manoeuvres available in the “Open Class”.
 - c. If there are less than three entrants, any competitor flying with a scale glider may then enter the “Open Class” or the “Expert Class”. based on the competitor’s current class or Paragraph 3. The respective Class manoeuvres will apply.

8. **THE REQUIREMENTS OF A GLIDER IN “SCALE CLASS” ARE;**
 - a. The glider must be a reasonable representation (at the discretion of the match director) of a past or present commercially available full size glider.
 - b. If the full size and model are equipped with a flight assisting power system, the competitor may only use this in case of an emergency whereupon the remainder of the competitors’ manoeuvres for that round will be cancelled at the discretion of the Match Director.
 - c. If the full size and model has a main wing aspect ratio of less than 23, the competitor will receive a 20% K-Factor handicap.



Sportsman's Class Manoeuvres

	Manoeuvres	K Factor
1	SPLIT S	5
2	ONE INSIDE LOOP	5
3	ONE ROLL	5
4	STALL TURN	6
5	IMMELMANN	6
6	HALF REVERSE CUBAN EIGHT	7
7	HALF CUBAN EIGHT	7
8	STRAIGHT INVERTED	7
9	TWO INSIDE LOOPS	8
10	TWO ROLLS	8
11	THREE TURN SPIN	8
12	DOUBLE IMMELMANN	9
13	OUTSIDE STALL TURN	9
14	THREE INSIDE LOOPS	10
15	VERTICAL EIGHT	10
16	REVERSE CUBAN EIGHT	10
17	CUBAN EIGHT	11
18	SLOW ROLL	12
19	INVERTED EIGHT	12
20	BARREL ROLL	12
21	ROLLING LOOP	12
22	SQUARE LOOP	12
23	FOUR POINT ROLL	13
24	HORIZONTAL EIGHT	13

Mandatory Manoeuvres

1. **Split S.** The model flies S & L, performs one half roll, immediately followed by one half loop, and then flies S & L.

K5



2. **One Inside Loop.** The model flies straight and level (S & L), performs one inside loop and then flies S & L.

K5



3. **One Roll.** The model flies S & L, rotates smoothly around its longitudinal axis and then flies S & L.

K5



4. **Stall Turn.** The model flies s & l at 90 degrees to the centre line and just past the centre line, performs one-quarter of an inside loop (to a vertical attitude, and at a position about 45 degrees from the centre line from the viewpoint of the judges), continues to fly vertically upwards for a short distance, yaws (into wind) through 180 degrees, flies vertically downwards for a short distance, performs one-quarter of an inside loop, then flies s & l at the same altitude but on the opposite heading to the start of the manoeuvre. **Note:** A score of zero should be given if the model falls more forward or backward than sideways.

K6



5. **Immelmann Turn.** The model flies S & L, performs one half loop, immediately followed by one half roll, and then flies S & L.

K6



6. **Half Reverse Cuban Eight.** The model flies S & L with the manoeuvre starting before the centreline, performs one-eighths of a loop up the 45° line and half roll to inverted on centreline into five eighths of a loop then flies S & L at the same altitude but opposite heading to the start.

K7

7. **Half Cuban Eight.** The model flies S & L, performs five-eighths of a loop (to an inverted 45° diving attitude), performs one half roll (the centre of the half roll being at the height of the centre of the loop), performs one eighth of a loop then flies S & L at the same altitude but opposite heading as the start.

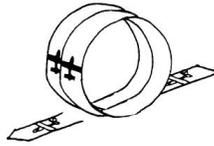
K7

8. **Straight Inverted Flight.** The model flies S & L, performs one half roll, flies S & L inverted for about five seconds, performs a second half roll, and then flies S & L.

K7



9. Two Inside Loops The model flies S & L, performs two consecutive inside loops and then flies S & L.
K8



10. Two Rolls The model flies S & L, rotates 720° around its longitudinal axis and then flies S & L.
K8



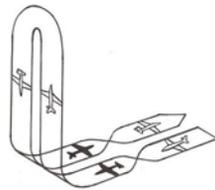
11. Three Turn Spin The model flies S & L into wind, slows down until it stalls and, in a fully stalled condition, falls into a spin. At the end of three revolutions the model recovers from the spin, flies vertically downwards to regain flying speed, performs one-quarter of a loop, and then flies S & L in the same direction as the start of the manoeuvre.
K8



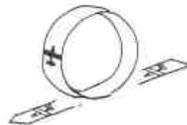
12. Double Immelmann The model flies S & L and performs one half loop, immediately performs one half roll, flies S & L for about one second, performs one half outside loop, immediately performs one half roll then flies S & L at the same altitude and heading as the start of the manoeuvre.
K9



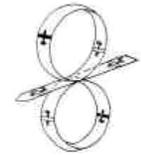
13. Outside Stall Turn The model flies S & L then rolls 180° to inverted on the centreline. The model then pushes to vertical and performs a stall turn. Push to inverted level attitude on the base line and roll 180° back to wings level and upright on the centreline. Model exits flying S+L.
K9



14. Three Inside Loops The model flies S & L, performs three consecutive inside loops and then flies S & L.
K10

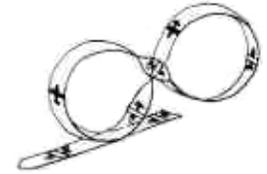


15. Vertical Eight The model flies S & L, performs one inside loop, immediately performs one outside loop, then flies S & L at the same altitude and heading as the start of the manoeuvre.
K10



16. Reverse Cuban Eight The model flies S & L with the manoeuvre starting before the centreline, performs one-eighths of a loop up the 45° line and half roll to inverted on centreline into three quarters of a loop, up the 45° line and half roll to inverted on centreline, performs five eighths of a loop then flies S & L at the same altitude and heading as the start.
K10

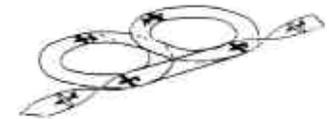
17. Cuban Eight. The model flies S & L, performs five-eighths of a loop (to an inverted 45° diving attitude), performs one half roll (the centre of the half roll being at the height of the centre of the loop), performs three quarters of a loop (to an inverted 45° diving attitude, with the centre of the loop at the same altitude as the first loop), performs one half roll (the centre of the half roll being at the height of the centre of the loop), performs one eighth of a loop then flies S & L at the same altitude and heading as the start.
K11



18. Slow Roll The model flies S & L, performs one roll then flies S & L. The roll shall be at a uniform rate and shall take approximately five seconds. **Note:** A significantly faster roll should be downgraded proportionately, e.g. a roll executed in approximately 3 seconds should be downgraded 50%, and a roll executed in 1 second scored zero.
K11

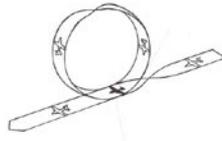


19. Inverted Eight The model flies S & L across wind, performs one half roll to an inverted attitude, turns (into wind) through 90°, immediately turns in the opposite direction through 360°, immediately turns in the first direction through 270°, performs one half roll, then flies S & L at the same altitude and heading as the start of the manoeuvre.
K12



20. Barrel Roll ??????? ?????? ?????????????? ?????????? ??????????
?????????????????
K12

21. Rolling Loop The model flies S & L then rolls 180° to inverted on the centreline and immediately pushes half an outside loop. At the top the model rolls 180° to inverted and pulls the second half of the loop to exit wings level and upright. Model finishes by flying S & L.
K12

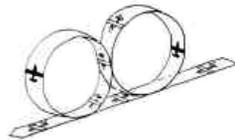


22. Square Loop This is a variation of the basic loop. The two vertical lines and the horizontal line on top have to be of the same length. The exit line at the bottom has to be at least as long as the other three sides. The quarter loops that connect the four sides have to have the same radius at each corner.
K12

23. Four Point Roll The model flies S & L, rolls through 90° to a knife-edge attitude, hesitates briefly before repeating the quarter-rolls and hesitations back to a wings-level attitude, then flies S & L.
K13



24. Horizontal Eight The model flies S & L, performs three-quarters of an inside loop (to a vertically downward attitude), performs one outside loop (to a vertically downward attitude), performs one quarter of an inside loop then flies S & L at the same altitude and heading as the start of the manoeuvre.
K13



Expert Class Manoeuvres

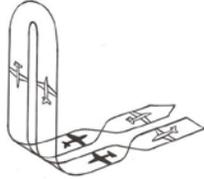
List A		
	Manoeuvres	K Factor
1	THREE TURN SPIN	8
2	OUTSIDE STALL TURN	9
3	ALTERNATING ROLL	12
4	SLOW ROLL	12
5	FOUR POINT ROLL	13
6	THREE ROLLS	13
7	CHING CHING CHONG CHONG	14
8	FOUR POINT TOSS ROLL	14
9	EYE OF THE TIGER	15
10	FIGURE M	15
11	THREAD THE NEEDLE	15
12	SHARKS TOOTH	15
13	DAMIAN ROLL	16
14	EIGHT POINT ROLL	17
15	ROLLING STALL TURN	17
List B		
	Manoeuvres	K Factor
1	THREE INSIDE LOOPS	10
2	VERTICAL EIGHT	10
3	REVERSE CUBAN EIGHT	10
4	CUBAN EIGHT	11
5	DOWNWARD SIX	12
6	ROLLING LOOP	12
7	THREE OUTSIDE LOOPS	12
8	SQUARE LOOP	12
9	HORIZONTAL EIGHT	13
10	OUTSIDE REVERSE CUBAN EIGHT	13
11	OUTSIDE CUBAN EIGHT	14
12	TWISTED LOOP	14
13	OUTSIDE BARREL ROLL	14
14	HORIZONTAL EIGHT WITH HALF ROLL	17
15	SUNNY SIDE UP	17



List A

- 1. Three Turn Spin** The model flies S & L into wind, slows down until it stalls and, in a fully stalled condition, falls into a spin. At the end of three revolutions the model recovers from the spin, flies vertically downwards to regain flying speed, performs one-quarter of a loop, and then flies S & L in the same direction as the start of the manoeuvre.
K8


- 2. Outside Stall Turn** The model flies S & L then rolls 180° to inverted on the centerline. The model then pushes to vertical and performs a stall turn. Push to inverted level attitude on the base line and roll 180° back to wings level and upright on the centerline. Model exits flying S+L.
K9


- 3. Alternating Roll** The model flies S & L then rolls 180° to inverted, hesitates then rolls 360° in the opposite direction back to inverted, hesitates and then rolls 180° again in the original direction back to wings level and upright and exits flying S & L. Half way through the 360° roll must be on the centre line.
K12


- 4. Slow Roll** The model flies S & L, performs one roll then flies S & L. The roll shall be at a uniform rate and shall take approximately five seconds. **Note:** A significantly faster roll should be downgraded proportionately, e.g. a roll executed in approximately 3 seconds should be downgraded 50%, and a roll executed in 1 second scored zero.
K12

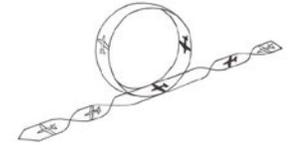

- 5. Four Point Roll** The model flies S & L, rolls through 90° to a knife-edge attitude, hesitates briefly before repeating the quarter-rolls and hesitations back to a wings-level attitude, then flies S & L.
K13


- 6. Three Rolls** The model flies S & L, performs three consecutive rolls, and then flies S & L.
K13


- 7. Ching - Ching - Chong - Chong** The model flies S & L then performs 2 out of 4 of a four point roll with hesitations at 90 degrees and 180 degrees then rolls in the

opposite direction to perform another 2 out of 4 of a four point roll with a hesitation at 90 degrees to bring the model back to the upright position then flies S & L.
K14

- 8. Four Point TOSS Roll.** The model flies S & L then performs two points of a four point roll, on the centre line the model performs an outside loop followed by the remaining two points of the four point roll. Model exits flying S & L.
K14

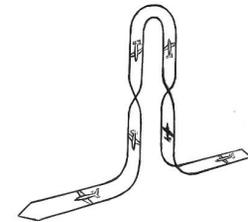


- 9. Eye of the Tiger** Eye of the Tiger is a triangle standing on its head. The model flies S&L, on the centre of the base line the models pulls to a 60 degree up line, at sufficient height to create a presentable size triangle, the model is pulled through 120 degrees to fly level and inverted. Once the model has flown an equal length leg, it is again pulled through 120 degrees to fly a 60 degree down leg, once the model reaches the centre point of the base line, it is pulled through 60 degrees to exit the manoeuvre flying S&L.
K14

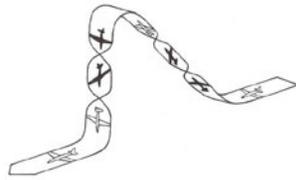
- 10. Figure M** The model flies S & L, performs one quarter of an inside loop, continues to fly vertically upwards for a short distance, yaws (into wind) through 180°, flies vertically downwards for a short distance, performs one half of an outside loop, continues to fly vertically upward for a short time, yaws (into wind) through 180°, flies vertically downward for a short distance, performs one quarter of an inside loop, then flies S & L at the same altitude and heading as the start of the manoeuvre. **Note:** A score of zero should be awarded if, in either stall turn, the model falls more forward or backward than sideways.
K15



- 11. Thread the Needle** The model flies S & L, performs one-quarter of an inside loop to a vertical up-line on the centre line. The model then rolls through 90° so that the top side (canopy side) of the model is facing the judges. The model continues on the vertical up-line then jaws through 180° as per stall turn manoeuvre. The model travels halfway down the vertical down-line before rolling through 90° followed by a second equal length down-line before performing a one-quarter of an inside loop, then flies S & L at the same altitude and heading as the start of the manoeuvre.
K15



12. Sharks Tooth The model flies S & L then pulls to a 45° up line. Half way to the top the model performs two points of a four-point roll. At the top of the 45° line, pull a tight radius (as on a square loop) to a vertical down line which must be on the centreline. Half way down the model must perform two points of a four-point roll and then is pulled to wings level and upright on the base line. Model finishes by flying S & L.
K15



13. Damian Roll. The model flies S & L, rolls through 90° to knife-edge attitude, hesitates briefly before rolling in the opposite direction through 180° to knife-edge attitude, hesitates briefly, then rolls in the opposite direction through 450° to a wings level attitude, then flies S & L.
K16



14. Eight Point Roll The model flies S & L then performs eight 45° rolls with equal hesitations between each 45° ending with wings level attitude and flying S & L. Plane must be horizontal inverted when on the centre line.
K17

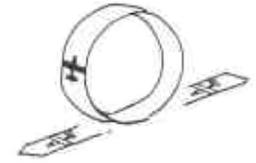


15. Rolling Stall Turn The model flies S&L on the base line, at the centre it performs a half roll to inverted, after 2 seconds the model is pushed to a vertical up line. Half way up, the model performs a half roll, at the top of the vertical line, a stall turn is executed, half way down the vertical line, the model again performs a half roll. The model is pushed to straight and inverted on the base line and when reaching the centre point, the model performs a final half roll to exit the manoeuvre flying S&L.
K17

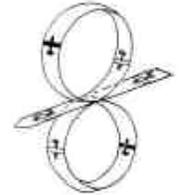


List B

1. Three Inside Loops The model flies S & L, performs three consecutive inside loops and then flies S & L.
K10

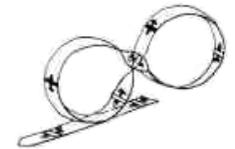


2. Vertical Eight The model flies S & L, performs one inside loop, immediately performs one outside loop, then flies S & L at the same altitude and heading as the start of the manoeuvre.
K10

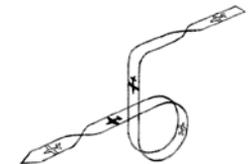


3. Reverse Cuban Eight The model flies S & L with the manoeuvre starting before the centreline, performs one-eighths of a loop up the 45° line and half roll to inverted on centreline into three quarters of a loop, up the 45° line and half roll to inverted on centreline, performs five eighths of a loop then flies S & L at the same altitude and heading as the start.
K10

4. Cuban Eight The model flies S & L, performs five-eighths of a loop (to an inverted 45° diving attitude), performs one half roll (the centre of the half roll being at the height of the centre of the loop), performs three quarters of a loop (to an inverted 45° diving attitude, with the centre of the loop at the same altitude as the first loop), performs one half roll (the centre of the half roll being at the height of the centre of the loop), performs one eighth of a loop then flies S & L at the same altitude and heading as the start.
K11

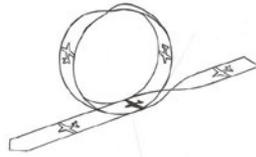


5. Downward Six. Flying with wings straight and level near the top of the box, halfway along the top leg, half roll to inverted. At the end of the leg, pull to a vertical down line on the centre line. Before reaching the bottom of the box, pull 3/4's of a loop exiting inverted. A second later, half roll to upright and finish with wings straight and level. NOTE: The top radius must be the same radius as the 3/4 loop.
K12



- 6. Rolling Loop** The model flies S & L then rolls 180° to inverted on the centreline and immediately pushes half an outside loop. At the top the model rolls 180° to inverted and pulls the second half of the loop to exit wings level and upright. Model finishes by flying S & L.

K12



- 7. Three Outside Loops.** The model flies S & L, performs three consecutive outside loops (downward) and then flies S & L.

K12

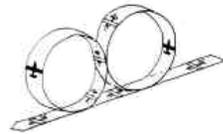


- 8. Square Loop** This is a variation of the basic loop. The two vertical lines and the horizontal line on top have to be of the same length. The exit line at the bottom has to be at least as long as the other three sides. The quarter loops that connect the four sides have to have the same radius at each corner.

K12

- 9. Horizontal Eight** The model flies S & L, performs three-quarters of an inside loop (to a vertically downward attitude), performs one outside loop (to a vertically downward attitude), performs one quarter of an inside loop then flies S & L at the same altitude and heading as the start of the manoeuvre.

K13



- 10. Outside Reverse Cuban Eight** The model flies S & L, rolls inverted before crossing the centerline and continues level inverted briefly, then performs 1/8 of an outside loop (to an inverted 45 degree climbing attitude), performs 1/2 roll (the centre of the 1/2 roll being at the height of the centre of the loop), performs 3/4 of an outside loop (to an inverted 45 degree climbing attitude), performs 1/2 roll (the centre of the half roll being at the height of the centre of the loop), performs 5/8 of an outside loop then flies level inverted for a brief moment before performing 1/2 roll to upright and flies S & L to complete the maneuver.

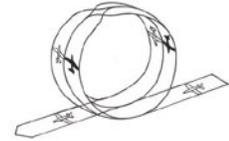
K13

- 11. Outside Cuban Eight** The model flies S & L, rolls inverted before crossing the centerline, performs 5/8 of an outside loop (to an upright 45 degree diving attitude), performs 1/2 roll (the centre of the 1/2 roll being at the height of the centre of the loop), performs 3/4 of an outside loop (to an upright 45 degree diving attitude), performs 1/2 roll (the centre of the half roll being at the height of the centre of the loop), performs one eighth of an outside loop then flies level inverted for a brief moment before performing 1/2 roll to upright and flies S & L to complete the maneuver.

K14

- 12. Twisted Loop** The model flies S & L, on the centreline pull half a loop. At the top of the loop the model rolls 180° to upright then performs one full outside loop where at the top of the loop again the model rolls 180° to inverted and pulls half a loop to finish wings level and upright on the centre line. Model exits flying S & L.

K14



- 13. Outside Barrel Roll** The model flies S & L then rolls 180° to inverted then rotates at a constant roll rate around both the longitudinal and vertical axes (i.e. outside loop and roll at the same time). The model should enter and exit the manoeuvre on the same heading, but should be flying at 90° to this heading when the model crosses the centre line at the highest point of the manoeuvre. The model exits the manoeuvre by rolling 180° to upright then flying S & L at the same altitude and heading as the entry

K14

- 14. Horizontal Eight with Centre Rolls** Enter with wings straight and level, before the centre line, pull the first 1/4 of a loop and perform a half roll which is on the centre line. Continue by pushing a complete outside loop and again on the centre line, perform a half roll. Push 5/4's of an outside loop to exit upright and with wings straight and level.

K17



- 15. Sunny Side Up** The model flies S & L, starts 1/4 inside loop then rolls 1/2 roll as the model approaches vertical and continues to push 1/2 an outside loop until the model approaches vertical then does 1/2 roll and pulls 1/4 inside loop then flies S & L to complete the maneuver.

K17



**RC
SD**

Eddie the Eagle



Kevin Farr, kevin@fvdv.co.za

© andrew jenkins

The story of a decoy bird that we thought could, and eventually did.

I had often looked at the Eddie the Eagle plan and felt it would be good to create something different and took to ordering the plan from overseas <<http://www.myhobbystore.co.uk/product/16122/sf418--eddie-the-eagle>>, and started a local build.

At the same stage we were hosting the Two Oceans Slope Soarers Black Eagle PSS festival. The history of the event means that we donate a part of the entry fee to the Percy Fitzpatrick Institute of African Ornithology, for the particular protection of the highly endangered Black Eagle (read “Verreaux’s Eagle” as the new required naming).

As per usual Dr Andrew Jenkins, BSc (Hons) (Natal, Pietermaritzburg) PhD (Cape Town), and a Research Associate at the Percy FitzPatrick Institute of African Ornithology was there at the slope to collect the rather large sized cheque, so that the PSS Festival had a photo opportunity relevant to the donation.

On talking about the idea to build Eddie, a plan was hatched to see if the eagle build could have a useful purpose beyond simply being a glider for fun days out.

Could, or would, the fake eagle be able to be used to study raptor numbers?

The theory was that the sheer size of the glider, the colour and the shape, were all to be scale, and that this would attract the attention of the smaller raptors such as Peregrine Falcons and Rock Kestrels.

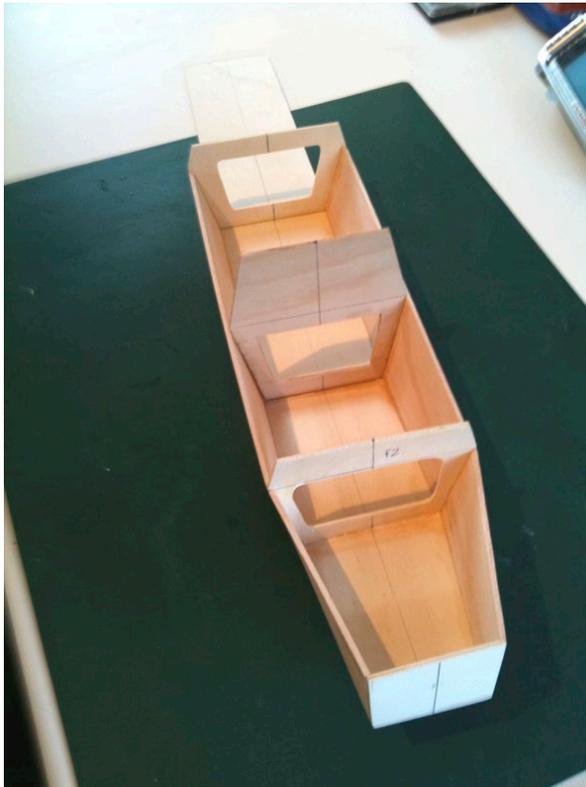
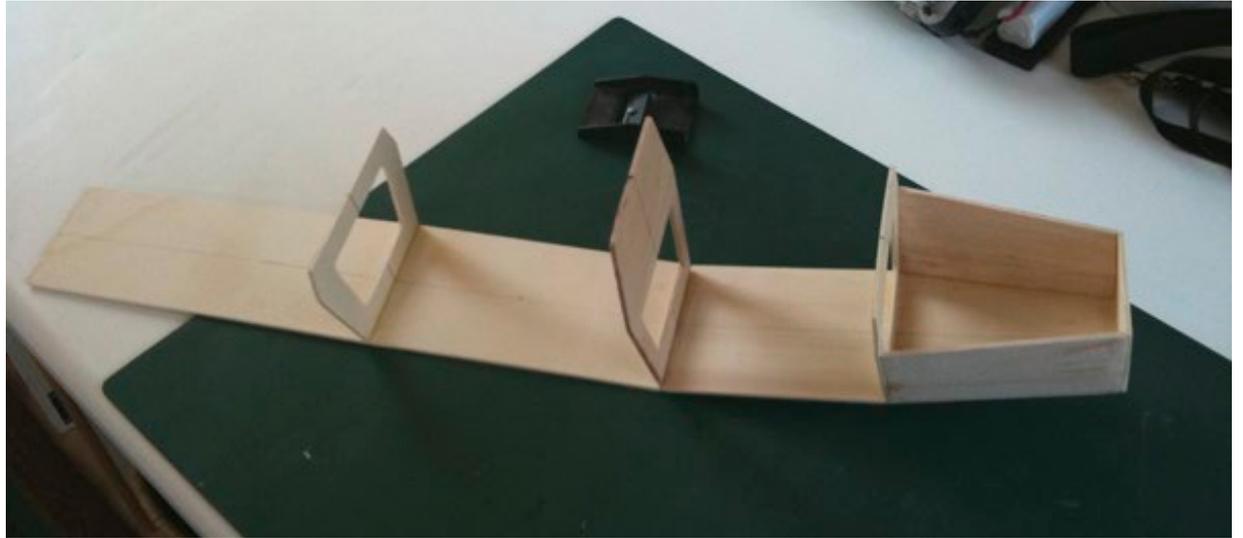
Think of the biggest gangster you can entering your neighbourhood and causing mayhem and looking to eat your kids as a snack.

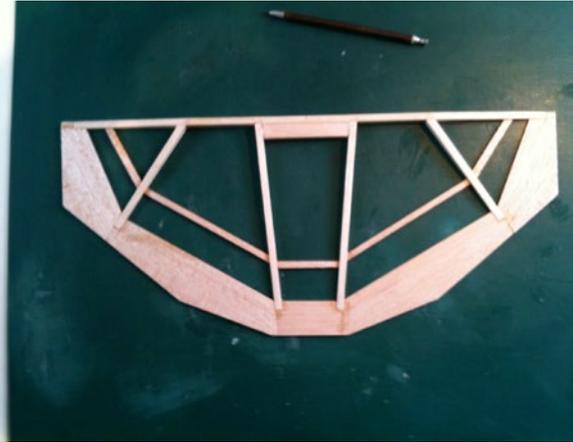
The general reaction in bird terms would be to chase and generally harass the suspect in no uncertain terms until they leave the area.

This idea being applied to hard to reach cliff faces would allow the ornithologists to count the bird pairs in residence as they raced to defend their territories, rather than hanging around all day waiting for a Verreaux's Eagle to stumble on by.

So, forcing the issue, and the expected aggressive response of the smaller raptors very quickly became the primary reason for the eagle build.

The build was started in 2010 and the base structure was created from ply, clad in foam and shaved to form.















At this point I lost a bit of momentum on the project and literally left it alone for two years in a dark corner, but thanks to the constant pushing from Andrew, the project was reborn with the introduction of Greg Nelson, a cameraman and documentary film maker that has taken an interest in the project, and so we kick-started the build again.

The feet were created from balsa and, between that and the head, these elements were the most time consuming.

Finding the eyes took several trips around town visiting haberdashery shops, familiarising myself with crafty things and such, until the correct size were sourced as they are paramount to the realistic vision the bird creates.

We undertook a trip to the Eagle Encounters operation on the Spier Wine Estate in Stellenbosch to do a real close up study of the Verreaux's eagle in action.

I have to thank Hans van Kamp who jumped in and created the foam core glass wings for me based off the old, but hugely realistic, wing sections. He works wonders, and does so at speed, so it was not very long before I was able to mate the wings to the fuselage.

The wingtips are of 1mm ply bent to suit on differing pots and pans, two of each required.

The largest volume of work being completed in 2014, saw Eddie suddenly take on realistic proportions and get colour applied, including the white “backpack” markings that are so distinct to the eagle.





Eddie finally weighed in at a portly 2.5 kilograms (5.5 lbs) which has set some limitations in terms of wing loading, but we are still testing the bottom range of the wing loading.

The day of the maiden was a complete let down. Eddie dove to the ground on launch and broke his head off! I had attempted to get away without the drag plates under the wings and this had created a real problem on the old foils.

So back to the drawing board it was and repairs were done to allow him simply to

fly, rather than be pretty, drag plates and all.

And so we gathered at red Hill on one of those impossibly strong SE days and set Eddie free, and watched as he wobbled around the sky struggling against the wind.

A rather poor landing from my side saw a few more minor repairs required but at least we were able to test the flight envelope.

Finally we set up for a classic day at Kommetjie to test the raptor theory.

Andrew was on hand, camera in hand. Greg was on hand, camera in hand. So there was no escaping the inevitable.

We knew there were ravens in the area, as well as some raptors and so hoped to bait them into the open.

Thanks to the TOSS lads for an awesome launch and Eddie took to the skies perfectly and we made a few photo runs to start with.

This was then translated into a high altitude glide at the top of the slope and bang on cue the ravens came out to



harass the living daylights out of the fake intruder.

At one stage two pair of ravens were involved in a 4-man formation with much verbal abuse being hurled at the

unwitting and apparently deaf decoy.

Moving further down the slope we were able to attract more attention from a pair of Jackal Buzzards who were insistent that Eddie take early leave, a pied crow

and very briefly from a Peregrine Falcon that set about doing an impressive attack on Eddie.

Having happily fooled the crows, it appears raptors are really going to be



© Andrew Jenkins



© Andrew Jenkins



taken by Eddie and we hope to pursue this particular idea much further to see more territorial behaviour exhibited.

This happening really did impress on us as a team the fact that Eddie as a proof of concept glider really works a treat.

This helps to stimulate a design advancement to a lighter and probably more modern craft with improved aerofoil design.

In the meantime we are building a reverse camera in the top of the fuselage

to capture the attack shots as they occur. This will take some time though, and we are happy to work with Eddie till he meets his fate on a hill one day, hopefully at the hands of one of his aggressors!



PIPETTES AND PALETTE KNIFES

Chuck Anderson, chucka12@outlook.com

Pipettes became one of my essential tools when I found that I could get 500 disposable pipettes for \$12 at Amazon which is about the price of a dozen pipettes at Tower.

As delivered, the pipette orifice is just right for applying Titebond and 30 minute epoxy.

Now that I can get them cheaply enough to be disposable, I have found pipettes indispensable for CA and applying all kinds of glue in inaccessible places.

The pipettes can be pulled out to a finer tip for thinner glues by heating with a heat gun. Pulling a pipette to a very fine point for thin CA is tricky but I had 500 to experiment with.

I have found the easiest way to pull a pipette to a fine point is to clamp the tip of the pipette in a pair of forceps and anchor the forceps to the work bench with a weight as shown in Photo 2.

Rest your hand on the workbench while pulling the pipette and heating the tip with a heat gun. As soon as any movement is detected, move the heat gun away and stop pulling on the pipette. Then slowly pull on the pipette until the desired length is achieved. If more heat is needed, wave the heat gun briefly over the pipette.





This is how I use pipettes and palette knife in building the LilAn wing:

- The spar is glued to the bottom sheeting with a narrow bead of thickened epoxy.
- Nose ribs are then glued to the spar with thickened 30 minute or slower curing epoxy. See Photo 4.
- The rib is held in position until the epoxy cures with a drop of CA on the rib in contact with the bottom skin.



Pipettes are especially useful for applying CA in confined places or controlling the amount of Titebond applied to ribs for gluing sheeting to ribs.

I keep several pipettes in a stand on my workbench. The stand is made by drilling half inch holes in a block of wood. See Photo 3.

An artist palette knife is my favorite tool for mixing and applying epoxy.

The thin blade of the palette knife is much better than sticks or rigid tools for mixing epoxy.

The flexible blade makes spreading an even coat epoxy on a shear web when gluing to spar caps easy.

Narrow beads of epoxy for gluing wing skins to carbon fiber spar caps can be applied holding the palette knife on edge.

- After all nose and tail ribs are installed, move the wing to the edge of the work surface so the bottom skin can be clamped to the ribs with clothespins as shown in Photo 5. Hacksaw blades distribute the clothespin loads and prevents crushing the ribs. Pipettes make gluing the ribs to the bottom skin with thin CA easy.

• Use the edge of the palette knife to apply a narrow bead of thickened slow curing epoxy to the top of the spar. See Photo 6.

• Pipettes make it easy to spread a thin bead of Titebond to the top of each rib.

• Clamp the top skin to the wing with weights and clothespins as shown in Photo 7 and cure overnight.

After the job is finished, wipe the palette knife with a paper towel and throw away the pipettes.

How much heat and how much to pull is tricky and I ruined many pipettes practicing before I started getting successful pulls most of the time.



Voltage Limiter For Life 2S Rx Packs

<http://www.toss.co.za/voltage-limiter-life-2s-rx-packs/>

Posted by Georg Lerm, credited to Ralf Fuchs

RC pilots that use 2S LiFe battery packs in their model aircraft, here is a simple little circuit that can be constructed to drop the average voltage (6.6V) from a 2S LiFe battery to just below 6V. Thanks to Ralf for sharing.

Parts List:

- 2x Diode 6A 600V
- 1x Capacitor 3300uF 10V
low ESR type
- Heatshrink to suit
- Connecting wires and plugs
to suit your RC setup.

Tools Required:

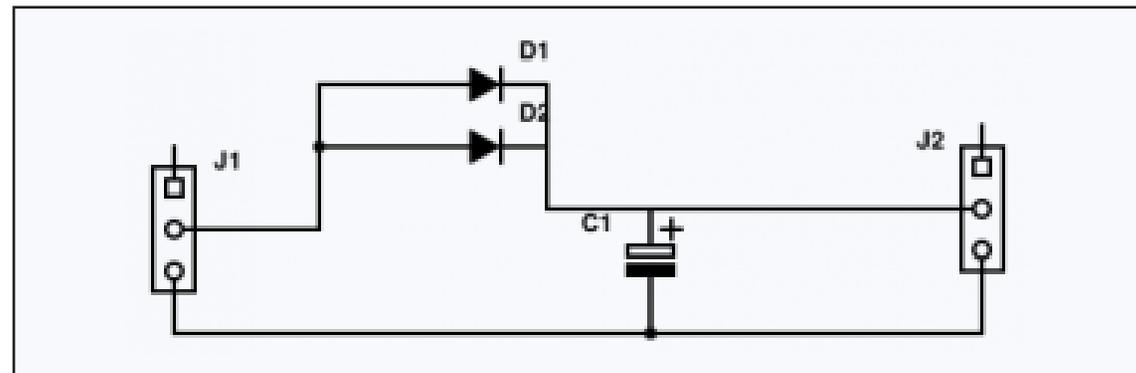
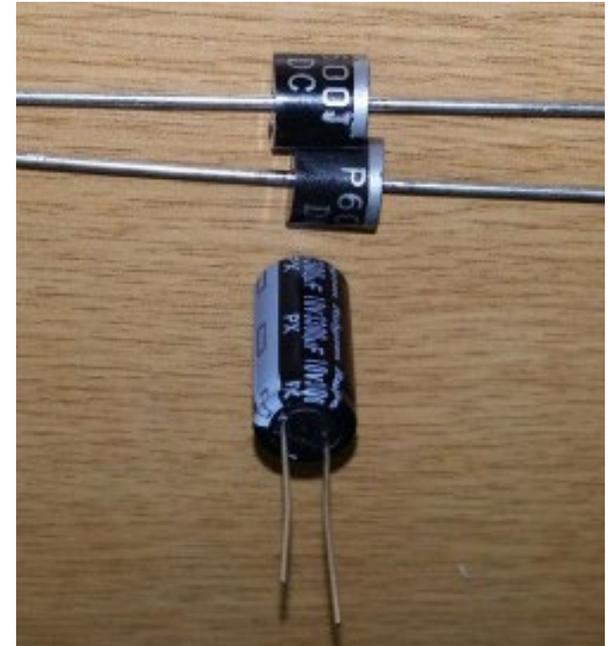
- Soldering iron
- Solder
- Small side cutters
- Needle nose pliers
- Helping hand stand
- Heat Gun
- CyA

The three major electronic components are shown in the photo at right.

Construction:

Solder the components together as shown in the schematic diagram, add your connecting wires/plug to suit your setup, heatshrink for protection.

DISCLAIMER: Neither myself or Two Oceans Slope Soarers take any responsibility for the owner making the modification to the equipment and causing failure of said equipment.



RC
SD



CEWAMS
Timberwolf redeux
September 26, 2015

Philip Randolph, amphioxus.philip@gmail.com

“Too cold.” That’s what our buddy, Erik Utter, texts when I ask him if he’s going. Two more also bail.

It was probably my fault. I’d watched the Intellicast forecast for Naches, Washington, elevation 1473’: 65°/35°. Timberwolf is at 6375’, almost 5000’ higher. With a drop of 3° - 5.5° per 1000’, I spread the word that it would be around 20°F at night. 50° in the daytime. Cold as my bleeding liberal heart when I use it as an ice-cube tray. Heh.

So by Saturday noon it was just Chris Erikson (of CE’s Wild Arsed Mountain Slopers, gawrd, I made that name stick, and nobody even beat the hell out of me for it), Chris’s sweetheart Melissa (always good to have a female along to prevent us old geezers from talking like 19-year-old frat boys), Steve Allmaras, and me.

Oh yeah, this weather that dissuaded probably a few: Absolutely gorgeous.

Timberwolf is about 15 miles east of Mt. Rainier, that aesthetic volcano in the Cascades, the coastal range. Long ago Chris posted directions at slopeflyer.com: http://www.slopeflyer.com/artman/publish/timberwolf_mountain.shtml.

Timberwolf has about the highest probability of big lift for any mountain slope site we’ve played at, especially if



Dave’s Ka-8 foamie

the winds have a westerly component. Typically air flows west along Rattlesnake Creek until Timberwolf Ridge impolitely turns dead across its path. Then the air

goes up. Often big up. Plus there is often lift even on the backside of the ridge. Steve and I showed around noon on a shirt-sleeve day with 95% blue sky.

Title page: The view from camp to Mt. Rainier



Dave Yardis' 2M foamy.jpg

Up top the lift was already blatantly cranking, but no Chris or Melissa. There's a big white truck, and a couple retired guys with a spotter scope. So we talk to them for a while. They point out four mountain goat beneath a bluff about half-a-mile away.

One explains, "I entered the lottery fifteen years before I got my goat tag. You only get one in your lifetime. The tag is good for a billy or a nanny, but they encourage you to take a billy. Can't really tell very easily though. They all look the same."

"How do you tell?"

"When they turn around. The billies have big ball sacks. Those over there are all facing this way."

"Maybe they should wear rear-view mirrors, back behind, so you could see. How far can you hit one?"

"About 400 yards."

"I've had domestic goat, up in the islands, when someone butchers one. Are you going to eat it? What do they taste like?"

"Yep. I haven't ever tasted mountain goat, but they're more closely related to antelope than to domestic goats."

Woops. I got distracted. I forgot for a moment that this is not a hunting magazine. Bother. Back to the subject.

As we head a couple hundred yards down to the spur-road campsite where we'll find Chris and Melissa I say, "Maybe we'll hear from you." Meaning, 'bang.'

We didn't.

We also didn't tell them that Chris's nickname and URL handle is 'mountain goat.' But even if we had he probably wouldn't have been in much danger. The hunters want one with eight-inch horns.

Yep, we had driven right by Chris and Melissa. From Portland she had arrived at Chris's at 11:00 PM Friday night. They got to the campsite about 3:00 AM Saturday morning. Hearsay has it that is

the hour of crankiness. But now they're having a great time over a late breakfast. We all dilly-dally a bit, and head back up.

Mainly because Steve has a servo in his Super Scooter that takes a bit of troubleshooting, I get my 60" Scout Bee (chevron) up first.

Chris: "Should I just start with my ballast?"

I fib, "There is no lift out here, that I am aware of." I have to click in trim to keep the Scout Bee down.

The lift is as big and steady as we've ever seen it. Chris slides forty inches of threaded rod into the wing joiner of his EasyGlider.

So pretty soon, and then probably a couple hours in the air, and then I went a bit too far back. Didn't quite make it forward.

I walked down the road hearing the faintest beeps from the lost model alarm when Damian Monda's burgundy Toyota comes trundling up. He hadn't told us he was coming.

Damian's ears must be a bit more directional than mine because he walks straight to my wing. Of which he says, "It's cold." The wing is the temperature of the air, which is chilly. But the sun is so warm it's hard to notice. All in all, putting on a layer or three when we choose is



Philip and his Scout Bee, Chris Erikson and his EasyGlider

more pleasant than dealing with summer heat.

Four gliders up. Damian is flying a 4' delta. Probably a decade ago Chris cut the cores with a hot wire and templates. Five.

Well, we knew Dave Yardis was likely to make it. With his two boys, Miles and Oliver.

At one point I call Miles "1.6 kilometers." That sets off the weekend with the kids spouting scientific facts at me. Something about how the longitude



Melissa and Damian

and latitude of the Giza pyramid being the first bunch of digits of the speed of light. And informing the adults that “The difference between fruits and vegetables is that fruits contain seeds.” “Is a pineapple a fruit or a vegetable? A coconut?”

They charge around the whole weekend finding crystals among the basalt.

Dave puts up his 2.25-meter foamy Parkzone Ka-8.

It’s tail-heavy pitch unstable, so he attempts to bring it in for a landing. The backside is so bumpy its wings flex up

and down a foot, but even back there the lift is so strong it won’t settle.

He says, “I wish I had fixed the airbrakes.”

Yep, those come with such. Finally he takes it well back, and then forward between a couple alpine fir. He coasts it up a steep narrow bit of backside grass for a great landing.

Lead in the nose and five planes are up.

I had gotten out the Jade Shogun. But I had forgotten that the last time I flew it, down on Oregon’s Bald Butte, it had stripped a servo. So back to the Scout Bee.

Then Steve puts together his 3-meter Acacia. He flies this carbon thing even on rock piles. He got it with one wingtip a bit origamified which may be what makes it whistle.

It slices twice as fast as anything else we put up. Most of us have a go at it. Finally Steve brings it around the backside, deploys flaps, aims for the most graceful entrance between Dave’s two trees, and hooks one with a wingtip. The Acacia helicopters to a safe landing.

Goofiest landing award: Me. I bring my Scout Bee around the back and manage to go between the two trees without hitting them. A few times, but with too much speed and lift to put it down. But.

Third or fourth: Just as I approach them a down-gust hits. I overcorrect, putting the Bee into a tight loop-and-a-half. If I had pulled back just a bit more I might have gotten it to slide gently up the bank. Not quite. It noses into soft dirt. No damage. Odd way to bleed off speed.

So we all go down the hill and do the usual camping stuff with the, "I made extra steak." And, "Take a shot of this." And, "Down Jack." Oh yeah. Species discrimination. I forgot to mention the two dogs.

By eleven there is frost on windshields. It probably did get down into the lower 20's. But everyone stayed warm. I had two down bags in my little Kelty tent, plus a catalytic heater.

Morning.

All up at the crack of 9:00 AM or so. Dave flies a mini-Radian, great micro stabilized flyer.

And it's another beautiful day. Up top, noonish, the lift never builds.

The one thing that sometimes stops Timberwolf is an east wind. So we mostly sit around in shirt-sleeves. Mostly.

I'm assembling my EasyGlider electric when I hear a low whistle. Steve has put up his Spinner DLG. He says, "The lift is very light." But he's flying the backside up about as far as good eyesight allows. I launch my EasyGlider electric. It barely



Steve piloting his 3M Acacia

climbs. Worse, unrecognized earlier damage makes the gearbox sound like a blender full of wine glasses. Its original folding prop had plastic set screws that stripped so I stuck on a prop that I thought would be equivalent. Plus the air at 6400' is a bit thin.

So I meander around the backside for a bit, looking for a good landing angle. Steve and Dave are back there retrieving something. They spot the aluminum spinner and carbon blades as they power away from the plane. Dave retrieves it. The Easy is 40' up a pine, but nothing a



Steve showing off the Acacia to Damian

bottle of water and a length of kite string hucked from upslope can't hook.

Dave puts his 1.4 meter Kunai, a fast, sheeted-wing electric, up. Zips around for a while.

But. Landings. Between the trees he hits the flaps. That adds a bit of dive,

and amidst grass and soft dirt its nose finds a rock. Mild scratches that look more ominous than the actual minimal damage.

Minor truck troubles: Dave's Jeep automatic transmission threatens. Chris and Melissa will follow him at least to the

highway. (Post note: he made it.) Steve backs over a rock in the parking area and rips a mud-flap off from behind the right-rear tire of his Subaru Forester.

On the road, Steve says, "Philip, you have two assignments. Type up a trip report. Also send out the trip report of Erik's and your flight to the Alvord Desert Dry Lakebed.

"Coordinate with Chris for a Saddle Mountain season closer for a date I unfortunately won't be able to make but will be able to appreciate vicariously.

"Also coordinate with Chris about his proposed exploratory trip to Clemen Ridge in order to find a date that I won't be able to make since he should scope out Clemen on his own rather than leading the rest of us on wild goose chases up into places that don't work.

"And watch weather for northerly winds at Sam's Dirty Ridge. And fix your old Encore [DLG] and more of your planes."

Now, as postscript, we all do like to tell Chris to find us good flying sites without having to get skunked ourselves.

It's like The Little Red Hen story – "Who will help me explore the hills?" "Not I", said the Philip."

From each according to his laziness, to each according to his greed. Ah well. Bravo, Chris.

So, all in all:

- The typical minor carnage.
- The same number of planes returning as arrived.
- Phenomenal lift Saturday.
- Spectacular views of Mt. Rainier, the Goat Rocks, and Mt. Adams.
- Good company.
- Capped off, when the drive back is almost done, by the partial lunar eclipse. Of the moon. Heh.

A missing CEWAMS delivers a belated physics comeuppance.

The last time we expected to see Marvin Brown was Memorial Day, 2012.

A throng of us had headed up to Pickens Mountain, north of Omak, in the Okanogan. That's in the dry northeast part of Washington State.

The last we heard from Marvin he was in Omak.

He never showed.



Philip's EasyGlider electric, sans prop and spinner, up tree

Marvin was an old friend of Chris's, and a bit of a wild man.

He'd work six months and then travel the country living out of his car. Story is that he hiked on Glacier Peak snowfields in oxfords.

He had a degree in biology.

Chris related that when he was two-weeks into his job as video engineer for Insitu, now part of Boeing, the manufacturer of the Scan Eagle UAV, Marvin showed up walking the perimeter of the building in a turban or a burnoose.

He wasn't a flyer, but he'd show up on our trips.

One October morning after a 6°F 5400' night below Bethel ridge with thirty persons from NWHikers.net and CEWAMS all at a campout called 'The Teeth of Larch' I'd found Marvin buried under sleeping bags and pillows and a pile of clothes and what-have-you in the back seat of his Saturn, head sticking out, looking like a hamster in a pile of sawdust chips.

Did I say 'wild man'?

But it was a few years earlier, down by Grayback Mountain in the south of Washington that the physics broke.

Eight of us were camped in some kind of white oak that oozed evil looking flammable black tar when it burned.

And Marvin asks Steve, with his Ph.D.

in Physics, and me, busy writing aerodynamics, (and who knows why he asks this): "Doesn't ice melt, just a little, when it breaks?"

Steve explains it doesn't.

Marvin says, "But doesn't it melt, just a little, when it breaks?"

I ramble off an explanation, "Molecular bonds are more like pop beads. They just pull apart."

Marvin says, "But doesn't ice melt, just a little, when it breaks?"

More rounds.

He won't give up.

We all laugh at this, and for another few years, remembering.

And then I am listening to an audiobook, James Gleik's *Genius, The Life and Science of Richard Feynman*, p.370, supposedly part of a conversation between Feynman and a press guy:

"For example, aunt Minnie is in the hospital. Why? Because she went out on the ice and slipped and broke her hip...

"Why did she slip on the ice? Well, ice is slippery... But you ask why is ice slippery?..."

"Because it is in the case of ice that when you stand on it, they say, momentarily the pressure melts the ice a little bit so that you've got an instantaneous water surface on which you're slipping.

"Why on ice and not on other things? Because water expands when it freezes. So the pressure tries to undo the expansion and melts it...."

That is, pressures can compress ice out of its crystalline lattice, at which point it liquefies.

During a fracture of ice, pressures must go all over the place.

Steve and I argued with Marvin, but now Marvin has the ghost of Richard Feynman on his side.

Chris would usually hear from Marvin every once in a while.

He hasn't.

And Marvin Brown is a sufficiently common name that he hasn't been able to find him via the Internet.

Marvin, if you're out there, get in touch.

And yep, a bit late, but you won your argument with Steve and me, over, "Doesn't ice melt, just a little, when it breaks?"

Congratulations, Marvin.

And sadness, if you're not still around.

