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**EXCLUSIVE**

# THE LYNX EFFECT

Exclusive first review of the super new micro-sized Oxy 3 machine from upgrade specialist Lynx Heli Innovations

Inside: TSA head • AccuRC V1.5 • Heli Maniacs • Spyder FPV upgrades



**THE MAGAZINE FOR MODEL HELICOPTER ENTHUSIASTS**

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# The Lynx effect



UNTIL NOW LYNX HELI INNOVATIONS WAS KNOWN AS ONE OF THE BIGGEST HIGH QUALITY UPGRADE MANUFACTURERS FOR RC HELICOPTERS, SO THE NEXT LOGICAL STEP FOR THEM WAS TO INTRODUCE THEMSELVES INTO THE MARKET WITH THEIR FIRST MODEL HELICOPTER, THE OXY 3



The presentation of the first prototype of the Lynx Oxy 3 was made at the Alpine Heli Smackdown 2014 event in Switzerland.

In the hands of renowned 3D pilot Tareq Alsaadi, the high performance of this little helicopter was shown to public and pilots. Now, a few months later the first Lynx Oxy helicopter is available.

## DESIGN OVERVIEW

Small electric helicopters are revolutionising the market with most of the major manufacturers now offering small helis in their range. These small helicopters are high quality, powerful and have amazing features for 3D flight. They are affordable models, with which to have fun in small spaces and to lose the fear of practicing new manoeuvres. In other

Raquel Bellot new team pilot of the Oxy Heli team



words these sizes of helicopters are fun to fly and for sure the new Oxy 3 tested here joins this segment of new sizes.

The designer is a known Italian pilot, Luca Invernizzi. No small helicopter on the market completely covered his needs for extreme 3D flight which was his reason for creating something new. It took Luca only one year to create the Oxy 3 from start to finish.

Oxy Heli made this model fully out of carbon fibre and aluminium. The rotor-head system is the DFC type, connecting the blade grips directly to the swash-plate. The Oxy is prepared to use blades up to 255mm blade length. The tail drive system chosen is tail belt drive, the cyclic servos connect directly to the 120° CCPM swash plate. The heli can handle 3S - 4S (1300

to 1600mAh) flight packs or changing the ESC up to 6S (800 to 950mAh). This little monster can handle up to 4500rpm and Oxy Heli is working on a future upgrade to stretch the kit up to 280mm blades.

At the moment there are two versions available: only kit and a combo that includes a special designed Oxy motor and a 40A hobbywing ESC. Both versions include 255mm Zeal carbon fibre main blades and two size tail blades. In our case we have chosen to build the combo version that includes the motor and ESC. There is no printed manual in the box, which we found a little unhandy but its included as PDF on the included on a CD. You can also download the manual via the official website [www.Oxyheli.com](http://www.Oxyheli.com)



## Features at a glance...

- Heli designed for intense 3D performance:
- Ultra rigid frame
- Triple main shaft supports
- Quality injection molded plastics
- Lightweight, high visibility and high-end airbrush canopy from Canomod
- Autorotation integrated into main gear hub

### MAIN ROTOR

The rotor-head has a simple but very effective design. It is almost fully made in aluminium and with the blade grips in one piece. The blade grip have the normal bearings inside, two radial and one thrust bearing. The main rotor grip arms on this model are made from plastic, which is in our opinion a good idea because it minimizes the damage to other parts in case of a crash. The arm uses double bearings to ensure smooth movement. This arm connects directly to the swash-plate.

The centre hub is attached to the main shaft by a M2 screw and extra secured for play by two screws that clamp the centre hub around the main shaft. The swash plate comes prepared for a normal flybarless rotor head with FOUR holes on top. We only need to use two for this type of rotor head, we can imagine that in the near future a traditional Flybarless rotor head will be released or for the multi rotor heads. The included carbon fibre 255mm main blades are of the new upcoming brand Zeal Blades.

### FRAME

Oxy Heli has opted for a simple design for the frame, composed of just a few parts and a compact structure. I like to highlight the quality of the hardware, its excellent compared with other smaller sized models. The screws are M1.5 but have big head that avoids the screws from stripping to quick. An important point because this is an advantage when it comes to the assembly and disassembly after a crash or for maintenance. Lynx Heli Innovation is a brand known for the quality of its helicopters upgrades for many brands, so we didn't expect less for the Oxy.

The frame is made up out of two carbon fibre side plates. It uses two aluminium bearing blocks and a third bearing block to support the main shaft. The bearing blocks serve as servo mount for the 3 cyclic servos. At the front of the frame we find a plastic tray that serves to mount the ESC at the bottom and the flight pack on top of this tray. The Oxy 3 has a nice mounting system for the battery using two rubber strips (O-Rings) with holes that attach directly to the frame. This is a simple and very effective system allowing you to change the batteries lightning fast.

The motor mount is mounted to the frame by four screws. The motor is located at the top and very close to the main shaft. The Oxy3 uses a helical main gear that attacks directly with the motor pinion. On top of the main gear an aluminium tail pulley is located that will move the tail. This little heli comes without the

typical one way bearing that allows you to have control over the tail during auto rotations. But in the reality with this kind of helicopters the objective is not really to practice auto rotations, so it isn't a big issue for us as pilots.

The landing skid is made of plastic and comes in one piece. The rear part of the landing gear is higher, this gives the Oxy3 some degrees of forward tilt. It is mounted to the frame with six screws and reinforced with the CF bottom plate to the frame. The fibreglass canopy is painted by Canomod in very attractive colours. Oxy spend lots of time in the air tunnel for the design of the canopy and its design is in harmony with the rest of the helicopter.

The Oxy 3 is designed that it can be repaired and back in the air very quickly after a crash.

### TAIL

The overall design of the tail is one of the highlights of this new model. The front tail boom case that houses two pulleys to guide the drive belt for proper operation. Eight screws close case using four carbon reinforcements into the frame. The tail boom does not have the traditional round shape but rectangular. This shape gives greater rigidity and therefore the Oxy 3 does not need the use of tail boom supports. Directly to the tail boom there is a tail servo support mounted which connects the tail servo with the tail rotor by a carbon fibre linkage rod. The tail guides are also very different from what we are used to see on other models. This model use a simple system with a small piece mounted at the bottom of the tail boom that guides the linkage rod.

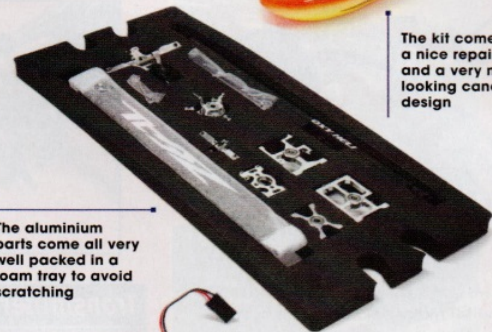
The tail case is fully made from carbon fibre, composed of two sides and with encrusted bearings. The left side is used directly as the vertical tail fin, the tail case is closed with 6 screws. The tail design is simple and functional with on the inside an aluminium pulley that moved by the belt. There are two bearings mounted on top as belt guide that prevents the belt from slipping off. The blade grips are fully made from aluminium maintaining the same design as the main blade grips. The kit includes two sets of blades tail, 47mm and 50mm. Mount one or the other depending on the RPM at which you are going to fly. We recommend using 47mm blades for hard 3D at high RPM.

### SETUP AND ELECTRONICS

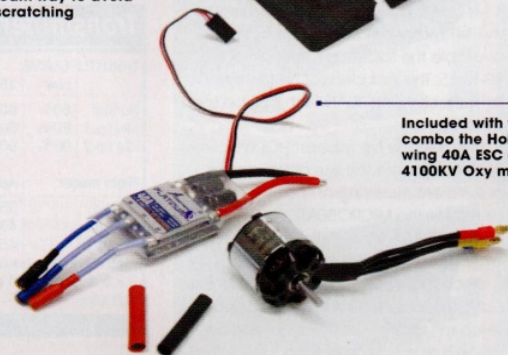
The combo includes a LYNX Oxy3 EOX 2214 4100KV motor with a 3.17mm shaft suitable for 3S and 4S battery packs. If we are going to fly with 4S batteries we should mount the 11T motor pinion and



The kit comes with a nice repair towel and a very nice looking canopy design



The aluminium parts come all very well packed in a foam tray to avoid scratching



Included with the combo the Hobbywing 40A ESC and 4100KV Oxy motor

The parts needed in every building step are perfectly presented and labelled in different bags

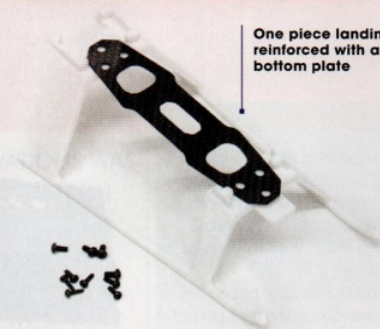


The complete tail assembly ready to be put together

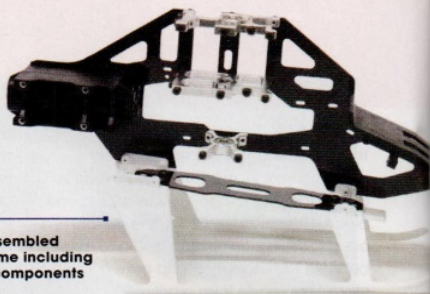




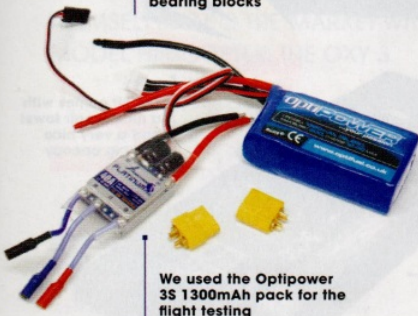
The main frame and the three silver coloured CNC bearing blocks



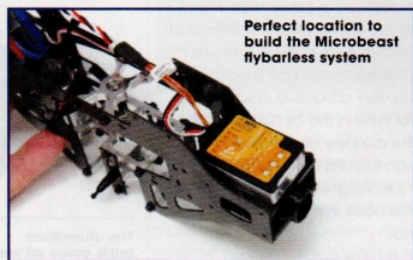
One piece landing gear reinforced with a carbon fibre bottom plate



Fully assembled side frame including all the components



We used the Optipower 3S 1300mAh pack for the flight testing



Perfect location to build the Microbeast flybarless system



Main-gear including the aluminium tail pulley

If we go for a 3S setup we should mount the 14T motor pinion. Oxy has optional available the following motor pinions: 12-13-15. The included ESC in the combo is the Hobbywing 40A which can be used up to 6S.

We used the Microbeast Plus flybarless system. Because the size of the model its sufficient mounting only one satellite directly to the MICROBEAST. To power the model and do the test flights we used a Optipower 1300mAh 3S 30C battery.

Since this was the first Oxy 3 I have ever built I was unsure about the settings and setup so I took my basic setup I use on my helis as a starting point but following the instructions in the manual. We tested various settings and this is how we liked it the most: We changed menu B into transmitter mode. The dual rates are set to 100%, exponentials on All, Ele, Rud to +10% on Spektrum, in case of Futaba it should be -10% and approximate 28% in idle up 2, 30% in idle up 1 and 32% in normal flight mode on the tail. To achieve the desired roll rate we needed to increase the endpoints (ATV) from 100% to 110% on elevator and Aileron and reduce the tail speed back to 90%. We used the Hobbywing 40A ESC that comes with the kit, pre-set with 6V BEC and settings for the EOX 2214-4100KV motor.

The correct ratio is as previous explained with a 14T pinion and a 4100KV motor, 10:000. With this setup we can reach a maximum head speed of approx. 4000 / 4500 RPM, this was the range I wanted to fly this helicopter.

The throttle curve is set the following way, we used the straight linear throttle curves. The motor has 4100KV and we used a 3S setup with Optipower 1300mah 30C packs and the 14T pinion.

### Transmitter settings...

#### THROTTLE CURVE:

	Low	25%	50%	75%	High
Normal	60%	60%	60%	60%	60%
Idle up 1	80%	80%	80%	80%	80%
Idle up 2	90%	90%	90%	90%	90%

#### Flight mode: Aprox. RPMs:

Normal:	3500rpm
Idle Up 1:	4000rpm
Idle Up 2:	4500rpm

Pitch curve have been set in all flying modes to -13.5 at low stick, 0 at mid stick and +13.5 at high stick.

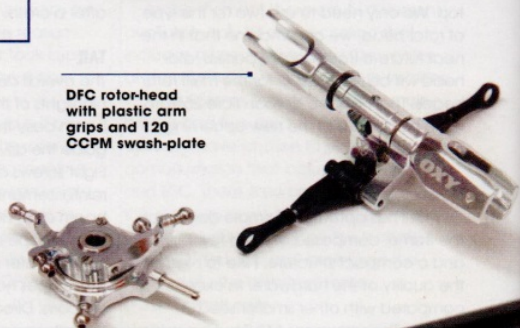
### TEST FLIGHT

Honestly I'm so used to fly 700 sized helicopters that most helicopters with a size less than 450 disappoint me... I have not managed to find a model that meets my needs and to enjoy 100% of its flight. There are always problems with the tail, power, accuracy, agility etc ...

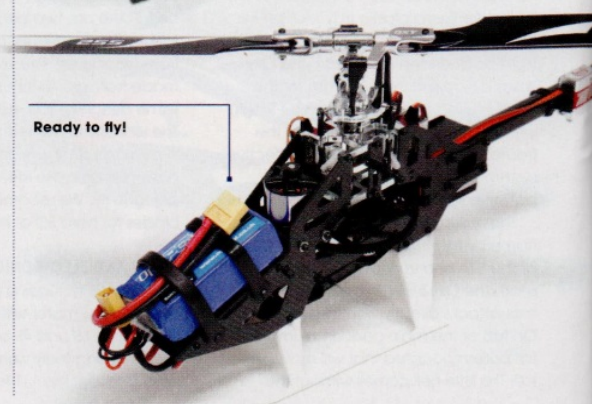
I focussed my view on the new Oxy3, the first Lynx helicopter and designed by Luca Invernizzi. This model directly caught my attention and within a couple of days I had my Oxy3 on the table. It had an intuition that this model could satisfy me. After a very successful build it was time to test it.

As soon as I spooled up this helicopter for the first time you could hear the powerful sound. When I first lifted the Oxy 3 up in the air I could notice that it was a very stable helicopter. It was time to start doing some speed flights and the model traced perfectly at all speeds. I started with some smooth 3D manoeuvres and its behaviour is very good with a very direct and precise response on the cyclic. The dynamic between both rotors are very

DFC rotor-head with plastic arm grips and 120 CCPM swash-plate



Complete finished tail assembly, 100% slop free!



Ready to fly!

# Design highlights of the Oxy 3

## FBL OPTIMISATION

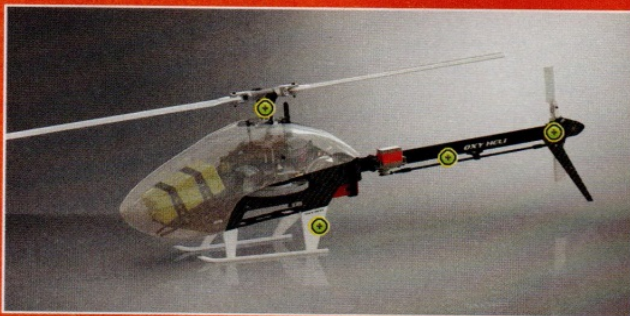
Flybarless (FBL) helicopters have quickly become the preference of both sport and extreme 3D pilots throughout the world. FBL controllers have continued to become better, cheaper and smaller. But has helicopter linkage geometry kept pace with these changes! The basic mechanical requirements for a FBL helicopter are straightforward, but not all helicopter manufacturers have considered the importance of optimal geometry for improving the FBL control loop.

Oxy started with a range of servos suitable for the Oxy3. Then they measured angular movement of the servo arm at different pulse widths and recorded the variation over different makes of servo, calculating the optimum swash plate ratio of collective to cyclic travel, and then simulated a range of swash plate and head geometries and integrated the previously measured servo deflections.

Oxy performed all these measurements and simulations with one goal – to optimize the Oxy3 servo-swash-plate-head geometry to allow modern FBL systems to perform at their best and to optimize their control loop behaviour.

Not all FBL systems provide users with control loop geometry feedback. This gives a false sense of security – you 'think' all must be ok, when in fact the FBL controller is working outside its best performance envelope. And when you do have feedback on the suitability of your control geometry, some helicopter designs leave you with few options to make changes.

With our Oxy3, all the hard work is done. When using almost any mini servo, and almost any FBL controller, you will immediately find the control geometry optimized for best performance. There is no need to modify head geometry, change the swash-plate, or scratch your head wondering what to do.



## LANDING GEAR DESIGN

The landing gear is often neglected in helicopter design. But at Oxy they have noted landing gear resonance induced by cyclic loads may have a negative impact on precision and stability of FBL helicopters. The landing gear can be the root cause of high frequency, high energy vibrations. Undercarriages are particularly prone to amplify vibrations leading to resonance if critical frequencies are hit.

Some basic physics calculations, corroborated with experiences from test mock ups, Oxy provided information that common undercarriage designs made from moulded plastics or CNC + CF plate may start resonating. The use of moulded plastic for the Oxy3 landing gear was considered a pre-requisite to keep costs down and provide a degree of protection during hard landings.

To decrease vibration and minimize the chance of landing gear resonance, the design team decided on a design incorporating different front and rear arches, in order to avoid cross-induced amplification of vibrations. At the same time we were trying to keep the expected vibration frequencies far from those which would induce resonance.

## TAIL BOOM OPTIMISATION

After some experiences with small models, tail as a whole appears a critical area especially for small sizes.

This is due to vibrations issues, but also mechanically, as traditional boom design poses some concerns.

First of all, the traditional round tubes and tail braces design result unnecessarily robust and thus heavy and below certain thicknesses and sizes it is not practical to go. Tail boom braces are prone to vibrations, so often pilots have to further add vib suppressors to control them. Round tube are quite cumbersome for tail precise mounting, as well as manufacturing of CNC tail box and tail clamps; often torsional displacement might occur, impairing quick tail boom replacement or precise mounting.

The Designers at Oxy strongly wanted to eliminate tail boom braces from Oxy design: to reduce weight and inertia improving the dynamics, to improve the silhouette, and control overall purchase and maintenance costs. Some basic studies were carried out to ascertain the real strength required in flight conditions to tail boom; the outcome of these analysis lead to understand that inertial accelerations (and thus forces on the boom) are quite higher on the elevator roll plane, than those relevant to yaw, which are tail driven thus controlled and dampened by tail gyro.

So, choosing an asymmetrical tube was the logic conclusion: stronger on the elevator axis, and reduce the size in the other direction: the result is the peculiar rounded-rectangular shape you can appreciate on Oxy. In addition to that, among other possibilities, that specific shape was selected as the overall tail box design result much rational and lighter than the rounded tube, leading to further area of improvement in tail designs.

## TAIL SYSTEM OPTIMISATION

A common limitation in performances of micro helicopters is related to tail behavior. As rpm increases, in addition to increased tail authority, vibration levels start to increase as well. This is evident to most pilots. Additionally, during hard & fast manoeuvres - those requiring high tail pitch - severe tail blow outs (loss of tail hold) can be experienced. This can lead to unnecessary crashes and loss of confidence. Pilots invest money on high performance servos in an attempt to overcome the problem, and sometimes even this is not enough.

Some practical tests, combined with the help of basic physics calculations, has shown that the correct solution can only be reached with properly designing rotating parts, in addition to reducing tail grip mass and precisely configuring grip arms.



Oxy 3 Fly Style / Head Speed / Main Blade / Tail Blade / Main Pitch suggestion chart

Fly Style	Head Speed	Main Blade	Tail Blade	Main Pitch
Hover	2500 / 3000	240 Plastic	30	+ 10 / - 2
Hy 20	3000 / 3500	240 Plastic	30	+ 10 / - 5
Tail 20	3000 / 3500	255 CP	30	+ 12
Head 20	3000 / 4000	255 CP	47	+ 14
Extreme 20	4000 / 4500	270 CP	47	+ 14

Oxy 3 gear ratio chart

Gear Pin	Speed Ratio	Ratio	Note
CR10104	Pinion 105-462.8 - 3.17 Motor Shaft	1.4	
CR10104	Pinion 131-462.8 - 3.17 Motor Shaft	12.237	Included
CR10105	Pinion 127-462.8 - 3.17 Motor Shaft	11.647	
CR10105	Pinion 131-462.8 - 3.17 Motor Shaft	10.769	
CR10102	Pinion 141-462.8 - 3.17 Motor Shaft	10.000	Included
CR10100	Pinion 120-462.8 - 3.17 Motor Shaft	9.200	

good and the tail works constantly and very accurately. The tail is always a weak point in smaller helicopters but Lynx has solved this very well in the Oxy3. In a few minutes it already gave me confidence to fly it very comfortable. After half of lipo pack it already brought a smile on my face and said to myself: "Finally a small helicopter that really makes me enjoy it"

Despite that its being a 300 size in just a few minutes you forget you're flying a small helicopter. It seems that you are flying a 500 sized helicopter! It has an excellent flight style and is easy to fly. This small monster is even addictive! For its size you may think it's a toy... but not at all. It's a real flying machine very powerful and accurate. The truth is that after testing so many smaller helicopters for some reason they always have disappointed me. The Oxy3 has made me change my mind, it is now possible to fly extreme 3D and with precision.

**THE VERDICT...**

The first helicopter of Lynx Heli Innovations leads the way in every way in its size segment. The design is very good with some very innovative points. A simple mechanics, with just a few parts and with an easy assembly. Everybody knows the quality of Lynx upgrades and their first helicopter was not going to be less. They took care of every detail of this little helicopter. In terms of a 300 sized helicopter, it's a success. Small helicopters are very popular because they use small batteries, are quite economical and can be flown even in smaller spaces. The flying style is brutal. It's powerful, agile and very precise. The tail was for me one of the key points to go for this model because it works equal as in my bigger helicopters. The Oxy3 is a helicopter with an addictive and fun flight. I think it will be a model that will be seen a lot at the flying fields and if you're thinking that the Oxy 3 could be your next helicopter, you're not wrong!

I joined the team of Oxy Heli with this smaller model so you will be seeing me fly this little monster in the upcoming events!

Raquel Bellot



X-ray view of what's behind the Oxy 3 canopy, showing that there is plenty of room for everything



The CF bottom plate is used to mount the Spektrum satellite receiver

**Tech Spec...**



**Lynx Heli Innovations Oxy 3**

Length:.....	530mm
Height:.....	175mm
Width:.....	80mm
Main rotor blade length:.....	255mm
Tail blade length:.....	47mm and 50mm
Slant main gear:.....	140T Mod 0.5
Wide head speed range:.....	3000 (sport) to 4500 (insane 3D)
Tail gear ratio:.....	4.214 (14T pulley) for 3800-4500rpm
RRP:.....	£219.99 – Kit only
.....	£289.99 – Kit with motor & ESC

Available from:.....Fast Lad Performance  
 Tel:.....01226 281177  
 Web:.....www.fast-lad.co.uk  
 Manufacturer:.....Lynx Heli Innovations  
 Web:.....www.lynxheli.com



Although it's a 300 size model it feels like you are flying a 500 helicopter



SCAN THIS CODE TO WATCH A VIDEO OF THE NEW LYNX HELI INNOVATIONS OXY 3 IN ACTION!  
[HTTPS://YOUTU.BE/7FGETLGS\\_D\\_U](https://youtu.be/7fgetlgsd_u)

