

Black Horse Lysander

by John Armarego

This article covers the assembly and the test flight of the Black Horse Westland Lysander as a continuation of the introductory article on the same aircraft featured in the final edition of Airborne magazine.

The instruction manual from Black Horse on the Lysander is very good and provided most of the assembly instruction through well placed illustrations. The manual also provided additional information regarding the film covering, safety precautions as well as some interesting tips.

This article will follow through the assembly of this aircraft using the same steps as in the manual and can be used to supplement the manual. I have attempted to add additional information to assist with the construction and describe any modification I decided to undertake.

WING PLASTIC LIGHTS

The Lysander ARF kit comes supplied with vacuum formed wing tip lights and clear lens covers. They look really good and are a nice touch as they come from Black Horse straight out of the box. Sorry, but I could

SPECIFICATIONS

Wingspan: 2,540mm (100in).
Length: 1,600mm (63in).
Weight: 6.8 – 7.1kg
(14.96 – 15.62lbs)
Radio: 6 channels.
Servo: 8 servos.
Engine: 30 – 40 cc gas.
Motor: 2500 – 3200W,
250KV.
Recommended RIMFIRE: 1.60.
LiPo cel 12S 4-5,500mAh
ESC: 120A.



Lysander at home at the NAAS field after the first test flight.

not resist adding a little simple scale detail. (See Scale Matters article in this addition) The plastic light parts are easily assembled using the instructions provided. The manual suggests using CA (Cyanoacrylate) for mounting the lights, I prefer to use canopy glue as it sets clear, remains relatively flexible and the fumes do not affect the clear plastic. I used masking tape to hold the parts down firmly as the glue sets.

WING ASSEMBLY

The first step is to apply thin CA to the hinges in both the aileron and the flaps. This is a very quick process as the slots have already been formed in the surfaces. I use masking tape to hold the ailerons and the flaps in their normal positions and set them aside to dry for several hours; it is amazing how long CA can take to dry in certain conditions.

In air-conditioned dry air it can take a long time, do not use accelerant in this application. The wings have the servo lead draw string glued inside and this has to be pulled away to use it, making threading the servo lead wiring very easy. I added servo extension leads to both aileron and flap servos and used connector retainers on both leads for additional safety as these leads will get pulled regularly with the removal of the wings. The retainers I use are the Parsons Products radio plug safety retaining clips model JRP, they are easy to use and are very strong.

AILERON AND FLAP SERVOS

I used Hitec HS-475HB servos for both ailerons and flaps and are sufficiently for this application. The HS-475HB has been upgraded and is now the HS-485HB. I am a big fan of using the hex head allen key servo



A full view of this modified canopy of the Lysander is in Scale Matters page



After admiring the engine for about a week, the three cylinders were a perfect fit into cowl

screws for mounting the servos and for mounting the servo hatches. These fasteners have a large head area and are very nice to use with the correct allen key (Dubro 5/64). I use these fasteners where ever I can due to their quality and durability. If you purchase them in quantities of 500 you will not run out in a hurry and they are a lot cheaper in quantity.

Please note the servo trays for the flaps are the same, so both servos mount facing the same orientation. The

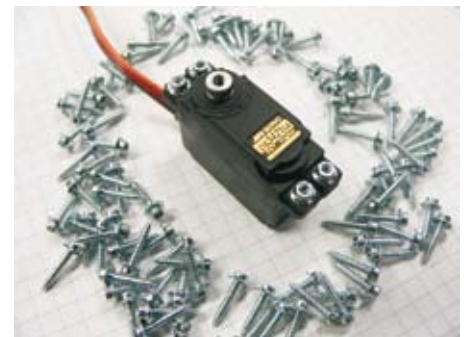
reason for this is that the flap servos just need a Y lead to control them both and do not need to be mixed to two different channels.

The control horns that are used throughout this kit are made from very strong injection moulded plastic. The horns slot into pre-machined mounts in the control surfaces and are retained using a M3 cap Allen head screws. The push rods and fittings, including a ball joint end and clevis, are also all provided and work very nicely.

FUSELAGE SERVOS.

The model comes with a well laid out fuselage servo tray. The tray has plenty of room for two elevator servos mounted on the left and right hand sides. The rudder servo fits nicely in the centre along with the forward mount for the throttle servo.

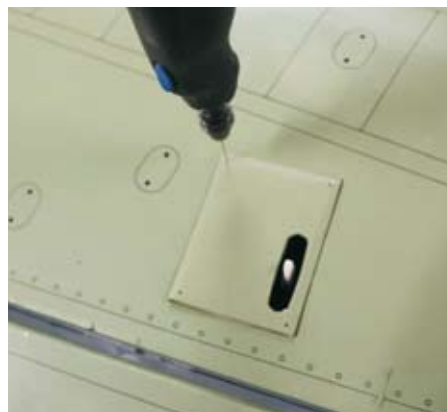
For the elevator servos I used two HS 635 HB, 6kg times two servos is



Hex head Allen Key Servo Screws. Let your local hobby shop to get them in for you in large quantities, you will be using them everywhere, they don't strip like the Philips heads often do



Servo lead draw string being used and Parsons Products radio plug safety retaining clips

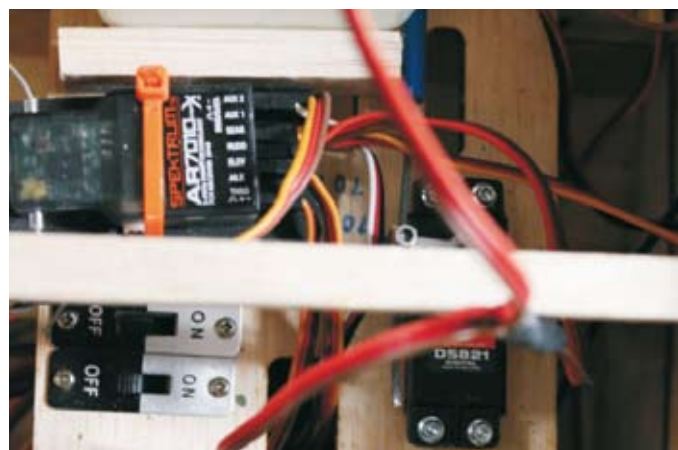


Pilot holes are drilled for the servo hatch mounting screws

Blackhorse Lysander



Control horns supplied



Receiver and ignition switches are internally mounted neatly on the servo tray. And yes the receiver is mounted on foam which is just not visible from this angle.

plenty of torque for this application. For the rudder servo I used the HS 635 HS, single 6kg is plenty for the rudder on the Lysander. For the throttle servo I used the DS821, any good standard servo, however, will do.

I was able to mount the two switches, one for the receiver and one for the ignition on the servo tray. This made for a neat installation. The switches are easily accessible by removing the quick release front cockpit and this installation position hides the switches from any external views of the aircraft. The charging leads are also easily accessible by removing the hatch.

INSTALLING THE ENGINE.

The Black Horse Lysander comes with the engine mounting box already having the thrust angles built into the

front firewall. The firewall also has the correct offset centre line marks as long as the propeller hub protrudes the set 152mm from the fire wall as described in the manual. This ensures that the propeller hub sits in the middle of the cowl even though the engine is not mounted in the middle of the firewall due to the required thrust angles offset.

When I received the Saito FG60R3 engine, the first thing I did after admiring it for about a week, was to check that the three cylinders actually fitted into the Lysander cowl. The fit was perfect, 'a match made in heaven'; there was even about 1mm clearance between the rocker cover Allen bolts and the cowl.

I removed the carburettor and the mounting baseplate from the engine. The mounting back plate was lined up on the firewall using the offset centre lines and was used to mark the mounting holes in the firewall.

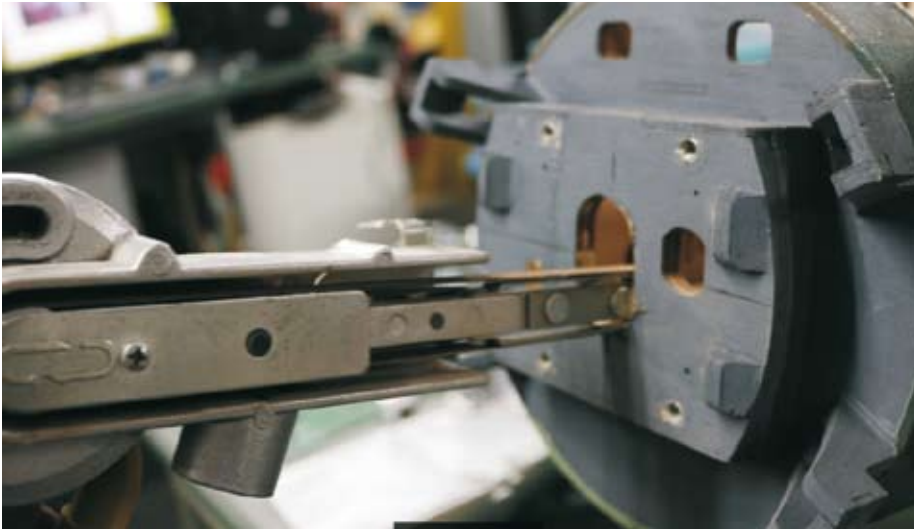
A Ryobi power file (very handy for aeromodelling) was used to make light work of the minor modifications to the firewall required to allow the carburettor induction flute to protrude through the firewall.

A new throttle linkage slot was also made in the firewall along with some recesses to ensure that the engine could be mounted as far back as possible. The bottom firewall blind nuts had to be shaved down to allow for adequate clearances with the firewall box.



Backplate removed and used as a template for the engine mounting

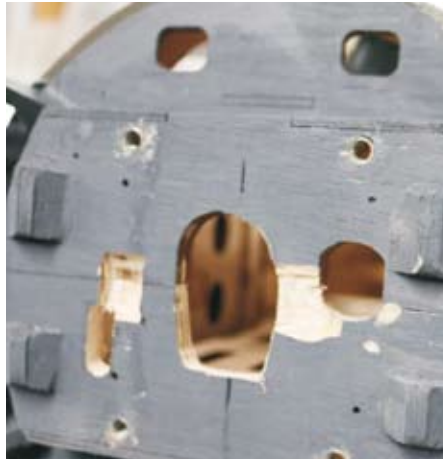
Blackhorse Lysander



Ryobi power file made light work of the firewall for new throttle linkage slot and some recesses for the throttle arm and carburettor



Blind nuts used on the bottom of the firewall needed to be cut to provide clearance



Knowing that the Saito engine was on the heavy side compared to a single cylinder two stroke and that this would cause the Lysander to come out 'nose heavy', it was very important to get the engine installed as far back as practical. The further forward the engine is from the centre of gravity the more effect it has on the centre of gravity which may have to be counter-balanced. I decided to use engine standoffs that are 10mm shorter than the ones that come with the FG60R3. This necessitated some minor modifications to the firewall to recess some of the carburettor components, but all in all I am very pleased with the way the Lysander accommodated the Saito triple.

A Smart Fly optical ignition cut-off was installed with the lead mounted to the firewall providing a clearly visible indication of the ignition status from the front starting position.

INSTALLING THE THROTTLE

An additional slot was made in the right hand side of the firewall that lines up with the throttle on the Saito engine. The servo tray has a mounting position on both sides for a throttle servo. This



Saito engine standoff on the right is 40mm long but the ones I used are on the left at 30mm



Saito triple mounted to the Lysander very neatly. Large flat washers used to reduce the crush on the firewall

Blackhorse Lysander



Fixed strut mounting points, the location of the blind nuts in the wing can be found with a magnet as they are well covered by the covering

made installing the throttle servo on the right hand side a very simple process. I used a braided throttle linkage cable as I feel this reduces the engine vibration strain on the throttle servo gears.

MOUNTING THE COWL

The firewall on the Lysander has four very substantial cowl mounting posts. I fitted the cowl as per the instructions and it was all that much easier with the Saito engine as only a small hole was required for the three exhaust exits at the bottom of the cowl, no large muffler required. A small hole was also made for the main needle mixture rod. The only modification I did was to install 2.5 mm blind nuts in the cowl mounting posts along with an aluminium counter sunk washer glued to the cowl. This makes for a very robust cowl installation.

INSTALLING THE MAIN GEAR.

Installed the main gear as per the instruction and it all looks robust and solid. I did make a few modifications however. I could not get the 5 x 50mm bolt to go through the axle, through the undercarriage leg and through the wheel spat. This was easily rectified by using longer bolts, M5 x 60 button heads purchased from FKO.net.au. I also did not screw the wheel pant to the fuselage as I considered that there would probably be too much movement at this point; instead, I screwed the wing strut brace mounting screws through the wheel pant to also restrain the pant. Tamiya XF-27 Black-Green acrylic can be used to paint the

strut mounting screw to hide their appearance.

INSTALLING THE TAIL GEAR

Again the instructions are very clear and the tail wheel assembly is straightforward. I had to increase the size of the hole in the rudder for the tail wheel arm. The bend in the tail wheel should rest on the tail wheel mount so that no vertical force can be placed on the rudder hinges

Note: when installed as shown, the vertical force would be transferred into the rudder hinges. I elongated the hole in the rubber until I achieved the correct alignments.

STABILISER AND FIN

Again all the hinges are of the CA type and go together very easily given that the slots have already been fabricated in the control surfaces and trailing edges. The horns are the same as used on the wings and are robust and go together easily.

The horizontal stabiliser uses an aluminium spar and locating dowel. It is a simple process to glue the horizontal stabilisers in position as they are held in the correct position by the spar, dowel and locating slots. The elevators are controlled using two servos one for each elevator half. The fuselage comes with the control cable, outer sheaths already installed, and the control rods and fittings are also provided. The vertical stabiliser is also glued into prefabricated slots;

The bend in the tail wheel must rest on the tail wheel support or vertical loads will be placed on the rudder hinges

however as the vertical stabiliser does not use a spar, care must be taken to ensure that it is glued at right angles to the horizontal stabiliser.

COCKPIT INSTALL

I held the canopies in place (front and back) for the first flights using industrial grade double-sided tape. This was to enable me to remove them at a later date as I add more detail to the cockpit area. As the aircraft has such a large glass-house canopy it is worth adding some more internal detail at a later time.

WING STRUT SET

The wing strut set fits together as per the instructions and is very effective and quick to assemble at the field. The fixed strut mounting points in the wing are M3 blind nuts and the struts connect to the undercarriage using a small retaining clip.

BALANCING

The balance point on the Lysander wing is a little tricky to find due to the shape of the wing. The balance point is 93mm from the leading edge. I found the best way to locate this point was to set up a string line between each leading edge

Blackhorse Lysander

CONCLUSION

The assembly of this model was a pleasurable experience. It all went together very well and the components supplied with the kit are all robust and of good quality. Very little modification was required to fit the Saito FG60R3 engine as the construction of this aircraft is very well laid out. There was even sufficient room to fit the ignition module nicely just behind the firewall, allowing the ignition leads to travel directly to the required cylinders.

The Lysander is easily assembled at the field with the way the wing braces have been designed. Ensure that you restrain the servo lead connector for the flaps and ailerons so that they can be easily accessed and connected when the wings are fitted at the field.

After the mandatory careful running in the Lysander was ready for the first test flight. The engine proved to be so well mannered and reliable through the breaking in procedure, I had no reservations with the test flight. I had my trusted heavy model inspector with me and we headed out to the flight line. The sound of the 60cc four stroke triple cylinder petrol engine is just magnificent.

I gradually applied up to ½ throttle and the Lysander quickly accelerated down the strip with ease, I held it down to gain a very safe speed margin before gently lifting off. The large 22 x 8 propeller driven by the 60cc triple created a noticeable left torque swing which I gently partially corrected for as a gentle left circuit was what I was intending on performing anyway. The Lysander climbed very quickly with only a ½ power setting.

Aileron performance is very similar to a 'Piper Cub' and the turns require coordination with the rudder to track nicely. I will play around with aileron differential and this may reduce the reliance on rudder, this is by no means a criticism, just a performance



Running in the Saito FG60R3 engine in the Lysander. You can just see the Smart-Fly ignition red LED inside the cowl. Engine cowl is a nice piece of fiberglass work. Note aluminium counter sunk washers used to strengthen the mounting points. Allen head bolts screw into 2.5mm blind nuts

of the wing and pull it tight, and attach it with masking tape. It is then an easy process to measure the required 93mm back from the string to the wing at the fuselage or any other point along the wing you may desire.

The manual instructs you to balance the aircraft in an upside down position. I was not in favour of doing this with such a large aircraft so I carefully balanced the Lysander right way up. As suspected, the Lysander came out 'nose heavy' but not by much.

By moving the two battery pack (2000mAh NiMH 5cell) to the tail cockpit area the balance was found to be spot-on. I mounted a battery support beam horizontally across the fuselage and a vertical support brace in the rear cockpit area and secured the batteries using cable ties.

No weight was added to balance the Lysander with the FG60R3 installed. Never fly an aircraft without being confident about the balance point.



Location of battery packs

COFG TIP
Pink string line was used to assist in marking out the required Centre of Gravity point along the wing

Blackhorse Lysander



Gentle climb out on the test flight



Low fly-by



End of a busy and successful day at the NAAS field in Canberra with the Black Horse Lysander

observation. The Lysander tracks very nicely in the air and is slipperier than I would have imagined; the Saito may have something to do with this. I have only experimented with a small flap setting and found no attitude change; I will practice further with full flap settings on subsequent flights as they should provide some high-lift and drag.

I found the elevator sensitive which is usually a good thing on a test flight but I had not set any exponential. The Saito engine adds to the Lysander's presence in the air and that Lysander wing is very distinctive. Several low level passes and it was time to land. The wind was alternating from the cross the strip and the up and down

the strip. I made the wrong landing direction call due to the uncertainty of the changing direction. The Lysander settled into a nice landing approach, I had only about 5 deg flap setting dialled in and it landed very nicely with a very long roll due in some part to the wind direction and some part to a higher idle setting on the new triple. It was an enjoyable delightful experience.

This Lysander definitely has my tick of approval. I am sure the Lysander, the Saito engine and I will enjoy many memorable flights. Drop into NAAS, bring a Lysander and we can do some formation flying. If you have specific questions about this model and the articles, you can email me at

aeromodeler@outlook.com and I will do my best to answer any questions. You may also find some interesting "build information" at www.nitrodude.com forumer.com

The web site for the National Aeromodelling and Aviators' Society (NAAS) can be found at www.naas.org.au or on Facebook. www.facebook.com/naasact/

Until then, happy building and plenty of flying. John.

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