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Xicoy X180

Gaspar's latest - powerful compact and light!

Turbine Package Contents:
- Xicoy X180 Turbine
- Instruction Manual on USB Card
- Brushless Fuel Pump
- Turbine Interface
- SDT (Smart Data Terminal)
- Leads
- Fuel Filter
- Fuel tubing

The turbine and main components laid out, note the supplied FOD guard as well as the minimal overall component count, due to the simplicity brought about by the digital control system.

The subject of the turbine test in this issue is the third and most powerful turbine I have tested from the ever increasing range offered by the Spanish company of Xicoy Electronica, under the leadership of the innovative Gaspar Espiell. I have been extremely impressed by the previous tests and have in fact my own example of the X45, which is giving sterling service in my Mini Ares. This new turbine has a nominal thrust of 180 Newtons, thus the X180 designation, and once again with availability being limited and many eager customers, it was always going to be difficult to obtain an engine for testing, but thankfully Jason Fletcher was extremely kind and offered to let us test his brand new and still boxed X180 before he had been able to run it or install the engine in a model.

Supplied in a very attractive full colour box continuing the design theme established by the X45 and X90/120, the turbine and its ancillary parts are nicely packaged and well protected from harm. The turbine itself was the first item removed from the box, and once again the very compact dimen-

X180 turbine complete with its attractive full colour box.

The compact size and very clean and uncluttered external appearance of the X180 shows up well in this photo.

Close up view showing very nice machining on the compressor and the single fuel connector.

View of the turbine wheel showing the neat casting of the blades, these requiring minimal balancing work.

sions immediately impressed, with the engine being only 247mm long, whilst having a diameter of 106mm and weighing a mere 1510 grams including mounts (1552 grams when the supplied FOD guard is fitted).

The turbine itself unsurprisingly is similar in outward appearance to its smaller brothers, utilising a machined from solid main casing with a purple anodised front cover, within which the fuel valves and ECU are situated. Having a very clean and uncluttered external appearance, as both the igniter and thermocouple are internally mounted, the engine has only two connections, a single 4mm fuel input and a three pin electrical socket, as the engine features full digital operation. The brushless starter motor is mounted in a machined aluminium bullet, also purple anodised, with three mounting legs for accurate and rigid mounting. Both the compressor and turbine wheel are very nice items, with a superb finish to the machined compressor in particular.

Ancillary items include the super neat and extremely small and light brushless fuel pump, smart data terminal, fuel filter, tubing and leads plus a small electronic hub unit which acts as the interface between turbine, battery, fuel pump and telemetry modules/display etc. This hub is also fitted with sensors that monitor the ambient temperature and atmospheric pressure so that the engine settings are automatically adjusted to give the best performance possible. As is now standard no battery is included, with the instructions recommending a 3 cell 11.1 volt Li-Po, the alternative option being a 3 cell 9.9v Li-Fe pack. A quick start guide is included in the box, which will be enough for experienced turbine operators, with the full instruction manual being supplied on a neat credit card sized USB stick.

As already mentioned, the engine is nice and light, whilst the fuel pump plus leads, hub, filter and tubing adds only another 140 grams; the 3S 2200mAh Li-Po battery used for all

Throttle	RPM	EGT Degrees C	Fuel consumption ml/min	1 Litre run time in mins	Thrust lbs	Thrust kg	Thrust N	TSFC
idle	28,000	465	75.4	13.27	1.0	0.5	4.6	0.2092
25% stick	52,000	443	139.2	7.18	2.9	1.3	13.1	0.1366
50% stick	75,000	420	222.2	4.50	9.4	4.3	41.9	0.0681
75% stick	99,000	461	353.8	2.83	21.2	9.6	94.4	0.0481
100% stick	122,600	652	629.6	1.59	41.6	18.9	185.3	0.0437

testing weighing a further 170 grams, bringing the total on-board weight to only 1862 grams.

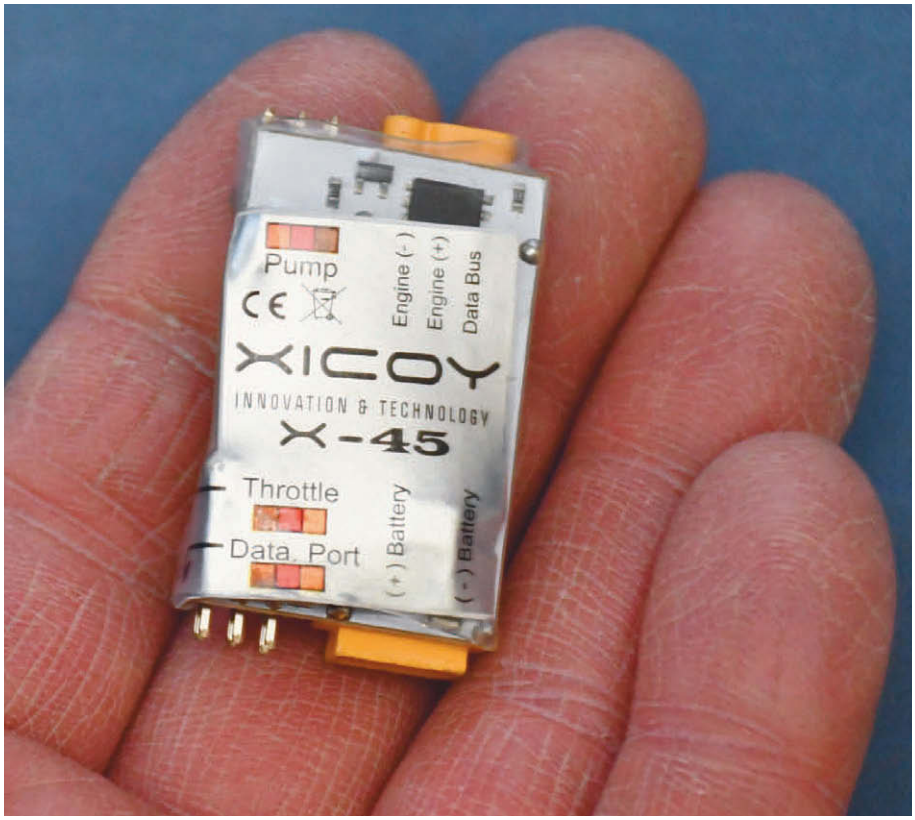
Given the low overall weight, installing the current smart data terminal would be viable in many models, as this weighs a mere 23 grams, whilst having a bright and easy to read colour touch screen which is used both for programming the turbine and for displaying information. Having the data terminal onboard is particularly useful as the unit stores the last 66 minutes of engine run time. Of course the ECU also stores the engine data, in this case the last 51 minutes of run time. Note that there is an alternative engine package available, this seeing the hub and smart data terminal exchanged for a single integrated hub with monochrome data terminal, this being permanently installed in the model.

With the model on the ground the smart data terminal can be disconnected from the interface unit, and a 5-10 volt battery connected to it to allow the stored data to be viewed, this can be in real time, or at 10 or 100 times normal speed. Of course it is also possible to view all the turbine information via telemetry through the transmitter display, with Futaba, JR, Jeti, Multiplex, Hott, Spektrum, Core and FrSky now being catered for.

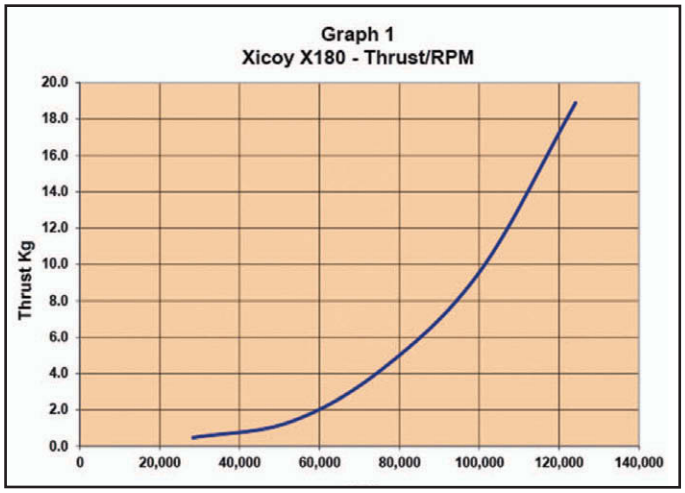
As per the other engines from Xicoy the FlexPower software in the ECU allows the thrust level to be adjusted to any level from a low of 100 Newtons to a maximum of 180 Newtons in seconds, so enabling the use of this lightweight engine in smaller airframes if required, with the knowledge that full power can be restored easily if the engine is transferred to a larger and heavier model at a future date. Also included is the ability to instantly change the settings in the ECU between Kerosene and Diesel.

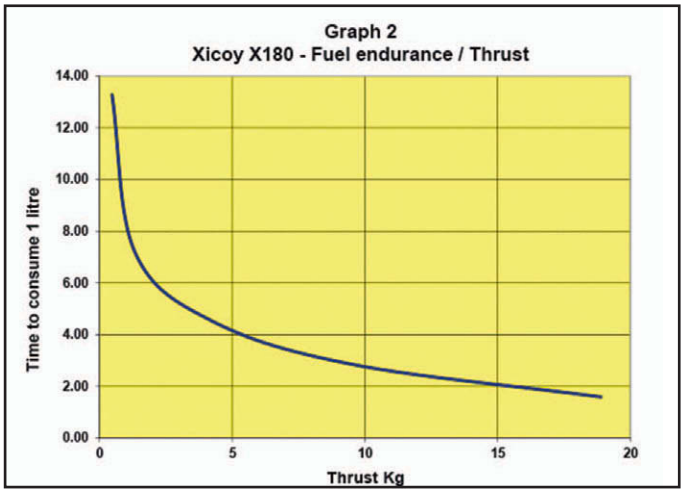
As was discussed in the X45 and X120 tests the X180 features an auto-restart function in the software – this being designed to allow the engine to restart automatically in the event that an air bubble in the fuel feed causes a flame-out. Although it has long been possible to restart turbines in flight, until recently this has been limited to turbines used in

The very compact and beautifully manufactured brushless fuel pump, which incorporates a neat mounting lug on the rear.



The electronic hub interface connects turbine, battery, fuel pump and telemetry modules/display etc and as can be seen, is common to other engines in the range.





large gliders, due to the need for the engine to cool down to below 100º C before it can be restarted. The cooling procedure of course takes time, and as the engine is then cool it also takes a considerable time to complete the restart, so it used to take anything up to 2 minutes for a restart in the air, not too practical for the vast majority of jet models. The Xicoy auto-restart system operates in a very different way, the ECU software detecting when the engine has flamed out due to an air bubble/fuel interruption, and in this event it automatically commences an aggressive restart procedure that should in most cases restart the engine within 10-15 seconds, this dramatic difference being due to the engine being restarted whilst still hot.

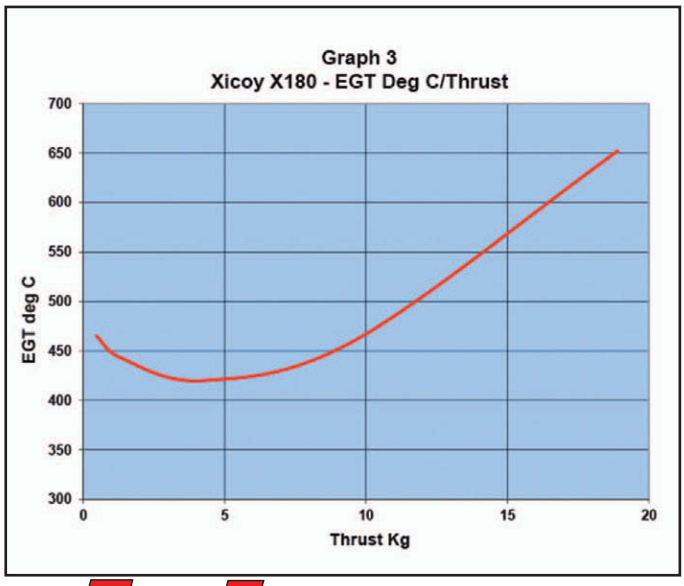
As is detailed in the manual, the use of this auto-restart function should be carefully considered before being activated, as its use could result in a fire in the event that a crash occurs as the engine is restarting. The default setting in the software is to have the auto-restart function switched off, with the recommendations for use focusing on lightly loaded jets, jet gliders and multi engined models, basically any airframe that is likely to be able to fly/glide for at least the 10 seconds required for a restart. The manual also suggests simulating a flameout situation to test if the restart function will in fact be helpful, and this makes a great deal of sense. The use of the auto-restart function should not be seen as an answer to poor installations or fuel supply problems, it should be used purely as an emergency feature that might save an airframe and allow investigation and correction of the problem.

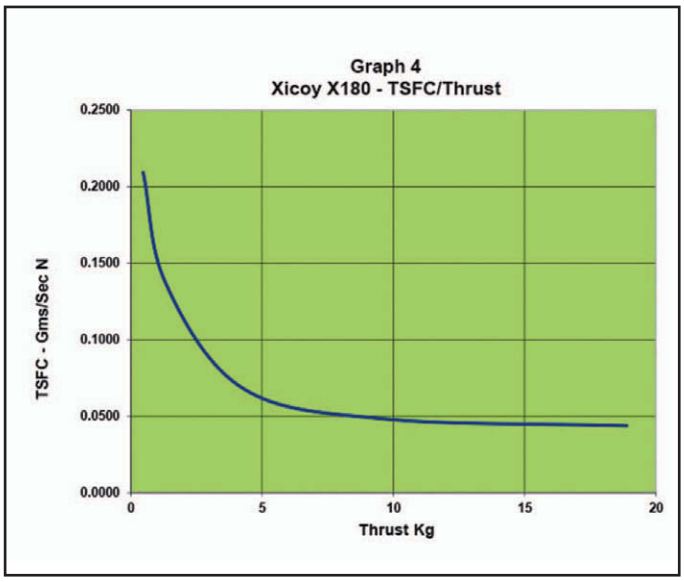
The X180 does offer another restart option, this being aimed primarily at usage in (large!) gliders, where the engine can be shut down normally, and it then goes through its standard shut down procedure. Once the engine has cooled to below 100° Centigrade the engine can be restarted from the transmitter simply by raising the throttle stick and trim. Of course this takes far longer than the auto-restart, but for glider usage it allows the engine to be restarted if height is lost, and does not impose the stresses on the engine brought about during an auto-restart.

With the engine mounted on the test stand, ancillary items connected, and ECU programmed, a start was commanded, which the engine carried out without fuss, it taking around 70 seconds before the engine was at idle with control having been passed to the radio system – starts with the engine warm shaved around 10 seconds off this.

The X180 ran very smoothly at all throttle settings, with almost no variation in rpm, and it was simple to get the engine running at the exact rpm points required as part of the testing process, this being one of the advantages of the brushless fuel pump, which runs at much more precise rpm than a brushed motor.

A second advantage is that this consistency of running will be maintained over a much longer period, as unlike a brushed motor, there are no brushes to wear, which would





change the running characteristics of the pump, and in turn the turbine.

Acceleration was good, being measured at around 4.5 seconds from idle to full power, whilst deceleration was almost exactly the same. The corrected full power figure of 185.3 Newtons was comfortably above the claimed figure of 180 Newtons, although the full thrust rpm of 122,600 was also slightly above the specified 122,000, whilst it should be noted that the engine was being run on kerosene with 5% oil (Power Model Jet Oil), rather than the 4% recommended (5% can safely be used according to the instructions), so a small amount of power is being lost here. Overall a very impressive outcome, whilst the idle thrust figure was extremely low for a powerful engine such as this at only 4.6 Newtons, this being fractionally below the figure of 4.8 Newtons specified.

Fuel consumption was very slightly above the claimed figure of 470g/min at 493g/min, or 630cc per minute, an excellent figure, and completely logical, given that the maximum thrust was also above the specified figure.

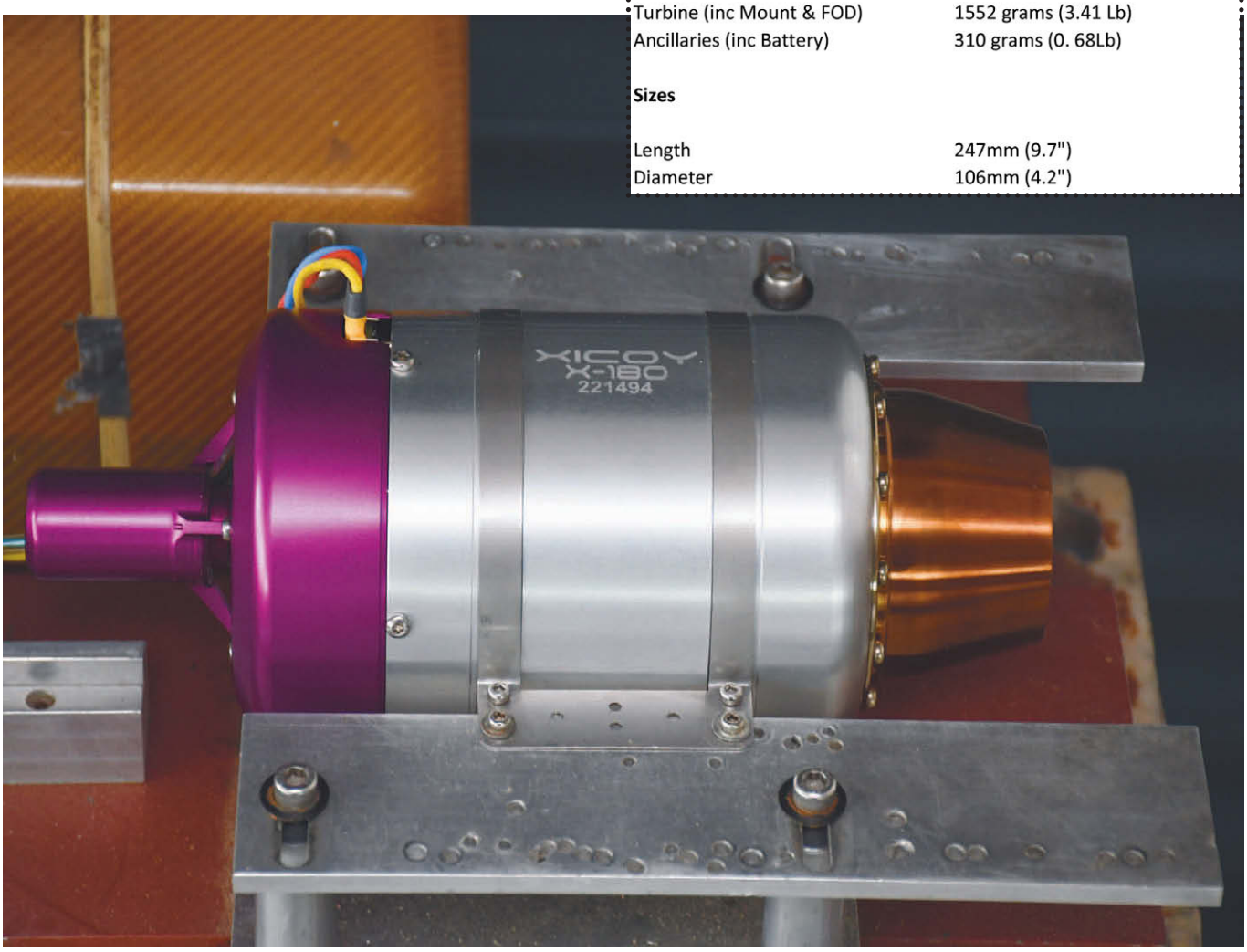
One useful facility available via the Xicoy website is the ability to download drawings of the engines in pdf, stl or dxf formats so that a dummy engine can be 3D printed; this can then be used during the building/assembly of a model instead of the real engine, avoiding any possibility of dust or small items getting into the engine during the build.

In summary I was once again impressed by a new engine from Xicoy – the X180 is of compact dimensions and is nice and light. It is user friendly in both installation and operation, yet with a truly excellent performance across the board in terms of thrust, acceleration and fuel consumption, whilst being available at a very competitive price. I am sure that the X180 will emulate the success of its smaller brothers, and become popular for use in a wide number of models, given its potent combination of size and power, not to mention its superbly smooth running characteristics and effective and rapid auto-restart system.

Colin Straus

WEBSITE
www.xicoyturbines.com

Test Results	
Idle RPM	28,000
Idle Thrust	4.6 Newtons (0.5Kg/ 1.0Lb)
Idle Temperature	465 degrees Centigrade
Maximum RPM	122,600
Maximum Thrust	185.3 Newtons (18.9Kg/41.6 Lb)
Maximum Thrust Temperature	652 degrees Centigrade
Fuel Consumption at Max Thrust	630ml/min
Fuel Used	Kerosene
Lubricant	Power Model Jet Oil
Fuel/Oil Ratio	5% (20:1)
Weights	
Turbine (inc Mount & FOD)	1552 grams (3.41 Lb)
Ancillaries (inc Battery)	310 grams (0. 68Lb)
Sizes	
Length	247mm (9.7")
Diameter	106mm (4.2")



Looking pristine at the end of the test programme, the X180 proved very easy and straightforward to operate.