Little Giant

M10Pro·涡喷发动机

Little Giant·M10Pro Micro Turbojet Engine

— The world's first engine in the same thrust class with no external accessories —

ONLY Φ6X4mm
MUST USE THE SPECIFIED FILTER ELEMENT
Designed & Manufactured by Little Giant
M10

Little Giant

Little Giant
Little Giant
TOUCHSTONE

High-standard Design

The M10Pro is an engine specifically optimized and calibrated for aeromodel flight. Based on the product structure of the industrial-grade engine W10, it features simplified flight controller interfaces, an added PWM interface, optimized combustion chamber acceleration performance, and an exterior crafted with higher manufacturing standards. It inherits the original structural and aerodynamic design with large margin, enabling stable operation under various climatic conditions. Compared to the industrial-grade version, this engine boasts more responsive acceleration and deceleration performance, as well as lighter connection cables. Under standard atmospheric conditions, it delivers a maximum thrust of 10.5kgf, supporting long-endurance and heavy-load flights, and is capable of withstanding ±15G overload.*

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Adjustable Thrust: 6kgf–10kgf

Among engines in the same thrust class, the M10Pro is smaller in size and lighter in weight, meeting the requirement of a single engine being adaptable to multiple aircraft models.

3S/12V 20A
M10

FORBID PULLING THE MOVABLE SHELF

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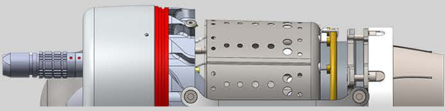
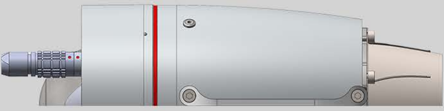
Design Advantages

Integration of Engineering and Aesthetics

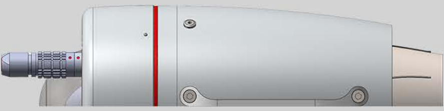
Within the current aerodynamic design system, the diameter of the front intake compressor of a micro-engine is always larger than that of the rear exhaust turbine. On this basis, the M10 series features an all-new engine exterior with an overall tapered profile (wider at the front and narrower at the rear) to reduce weight. Meanwhile, the combustion chamber inside the outer casing (engine case) has also been changed from the traditional cylindrical shape to a tapered shape similar to the casing for proper matching and installation. ⬇



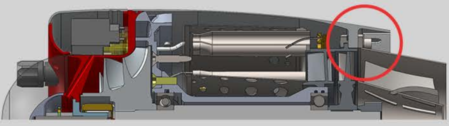
Under the same conditions, a curved casing can withstand greater forces than a straight casing. For a given engine structural strength requirement, using a curved casing allows for a thinner design, minimizing weight to the greatest extent. ⬇



To achieve visual continuity, the rear part of the outer casing is extended backward by a certain length, forming an enclosure ring structure outside the nozzle. This creates a staggered, layered profile with the lower nozzle lines, resulting in clean, smooth exterior lines for the entire engine and an aerodynamic appearance. ⬇



Any rotating component at high speed carries the risk of disintegration. To prevent injury caused by ejected turbine blades, the flange at the turbine rotation plane is thickened during casing design, and an additional penetration-resistant steel containment ring is installed inside the casing.
To further enhance containment capability, the material thickness at the containment ring formed by the rear extension of the casing is increased to twice the average thickness of the casing.
As a result, the entire turbine section is protected by four layers of defense. For safe operating positions regarding blade failure protection, refer to the user guide. This ensures user safety even in the event of turbine blade fracture. ⬇



Modular Accessories Integrated Internally

Eliminates complex fuel and electrical line connections, enhancing installation reliability and enabling ultimate ease of use.

Built-in ambient temperature and altitude sensors

Automatically adjusts engine starting and operating parameters according to external conditions.

发动机 Engine
电池 Battery 3S
油门 Throttle
回传 Telemetry

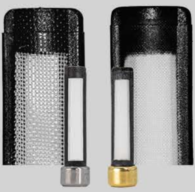
Integrated bubble sensor

An optical bubble sensor is integrated at the fuel inlet, which can display, record and remotely notify the user of fuel line leaks, helping to verify the reliability of the fuel system.

High-pressure atomization ignition system

The upgraded high-pressure atomization ignition system enables strong ignition and start-up for diesel fuel in low-temperature winter environments, reducing start-up time.

Two-stage coarse and fine filter elements



The two-stage filter design offers longer service life and higher filtration accuracy. Installed inside the line, it provides high reliability, ensuring no air leakage in the negative-pressure fuel system, no air bubbles in newly installed lines, and no manual venting required.
The filter status is visible through the transparent hose, and replacement is easy with the dedicated removal tool.

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Matching Ball Valve for Little Giant

Standard-equipped with a self-designed miniature ball valve, The ball valve is designed and manufactured in compliance with Chinese national standards.The tube fitting provides a locking pull-out resistance of up to 100N.It can operate in a pressure range from vacuum to 1.6MPa.The valve adopts a machined Teflon core, featuring corrosion resistance and smooth, precise on-off operation. Fully CNC-machined from aluminum alloy, it is robust and durable, and comes with a dedicated mounting bracket.

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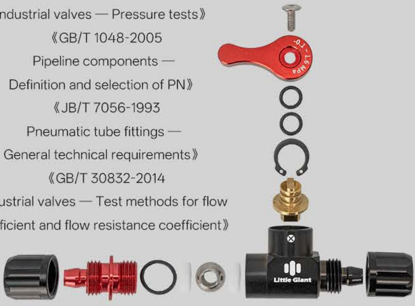
ONLY

Design, manufacturing and testing comply with the following Chinese national standards:

《GB/T 14514
Test Methods for Pneumatic Tube Fittings》
《GB/T 12220-2015
ndustrial valves — Marking》
《GB/T 13927-2022
Industrial valves — Pressure tests》
《GB/T 1048-2005
Pipeline components —
Definition and selection of PN》
《JB/T 7056-1993
Pneumatic tube fittings —
General technical requirements》
《GB/T 30832-2014
Industrial valves — Test methods for flow coefficient and flow resistance coefficient》

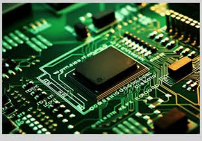


High-standard aerospace connector

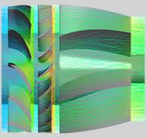
The aerospace connector is equipped with a locking mechanism for high reliability and easy plugging and unplugging.

Speed-sensor-free design

Main shaft speed is acquired via back EMF detection, immune to interference from complex electromagnetic environments.



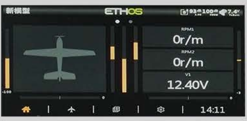
High-Performance Guide Vane Nozzle



Optimized based on CFD flow field analysis, the nozzle is fitted with high-temperature alloy guide vanes at an appropriate angle. While maintaining maximum thrust, this design effectively reduces the pre-turbine temperature and extends the overall service life of the engine.

Built-in parameter transmission module

It can conveniently transmit engine operating parameters back to the remote controller without the need to purchase additional modules.



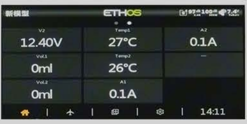
新模型 ETHOS

RPM1 0r/m

RPM2 0r/m

V1 12.40V

14:11



新模型 ETHOS

V2 12.40V

Temp1 27°C

A2 0.1A

Vol.1 0ml

Temp2 26°C

Vol.2 0ml

A1 0.1A

14:11

Aluminum Alloy CNC Mounting Plate

Compared with traditional hoops, the aluminum alloy CNC mounting plate is lighter in weight and never loosens or slips. Machined from a single block of aluminum ingot, a single-sided mounting plate can meet the load requirements of the engine in all operating scenarios.

Supports installation in any orientation

Typically, the engine restricts the relative installation angle between the main body and the ground during installation; otherwise, ignition and start-up may not be completed. Designed with user installation compatibility in mind from the outset, the M10 series engine supports normal ignition and operation at any angle, even in a vertical position.

vertical installation

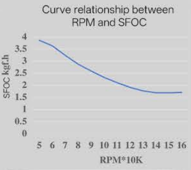
normal installation

inverted installation

lateral installation

Ground

Excellent economy



Long endurance, higher component efficiency and lower fuel consumption under operating conditions. Lower pre-turbine temperature under high load conditions, compatible with motorcycle lubricating oil.

Mobil
美孚小霸王
2T

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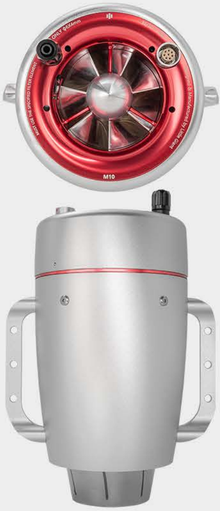
Standard Configuration List

GSU DISPLAY

POWER CABLES

MICRO FILTER

SHUT OFF VALVE



BRACKET

FUELLINE

GSU LINE

Reducer fitting

◆The color scheme, logos and surface treatment processes of the engine and its accessories are subject to change during production.

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Detailed Parameters

M10Pro Turbojet Engine Specifications

No.	Item	Unit	Value	No.	Item	Unit	Value
1	Standard Idle Speed	RPM	46,000	13	Flight Weight	g	997
2	Maximum Speed	RPM	150,000	14	Diameter	mm	91
3	Idle Thrust	N	5	15	Length	mm	176
4	Maximum Thrust	N	105	16	Battery Type	—	LI-PO3S
5	Exhaust Gas Temperature (EGT)	℃	695	17	Fuel Type	—	Jet Fuel / Automotive Diesel
6	Compression Ratio	—	3.7	18	Lubricating Oil	—	Mobil Super 2T 5% Mix Ratio
7	Air Flow Rate	kg/s	0.242	19	ECU (Engine Control Unit)	—	Built-in
8	Maximum Exhaust Velocity	m/s	430	20	Fuel Pump	—	Built-in
9	Maximum Power	kw	7.9	21	Starter Motor	—	Built-in
10	Idle Fuel Consumption	ml/min	80	22	Power Generation	—	Built-in
11	Maximum Fuel Consumption	ml/min	380	23	Maintenance Interval	h	2.5
12	SFC (Specific Fuel Consumption)	kg/（kgf·h）	1.85	24	Air Conditions: 1 atm, 15°C; Jet Fuel Density: 0.812 kg/L		

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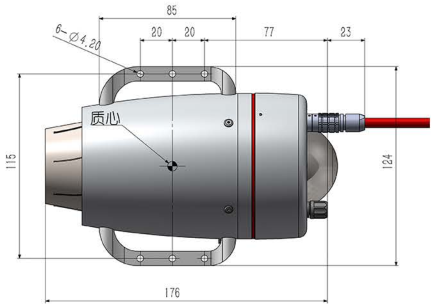
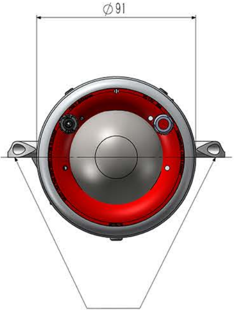
Product Specifications

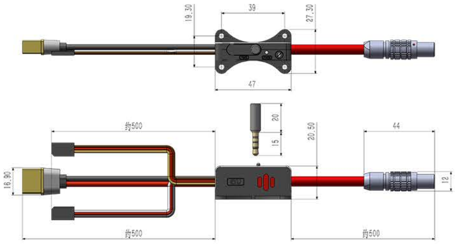
An integrally formed protective net is installed as factory default

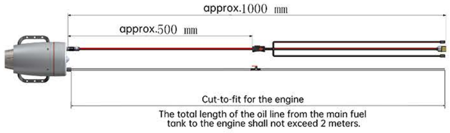
Unit: mm





Install on this side

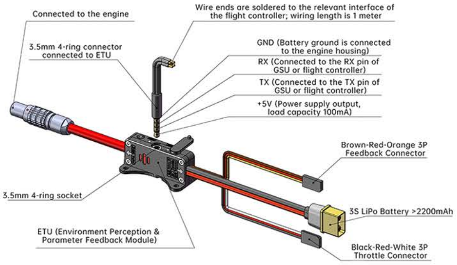




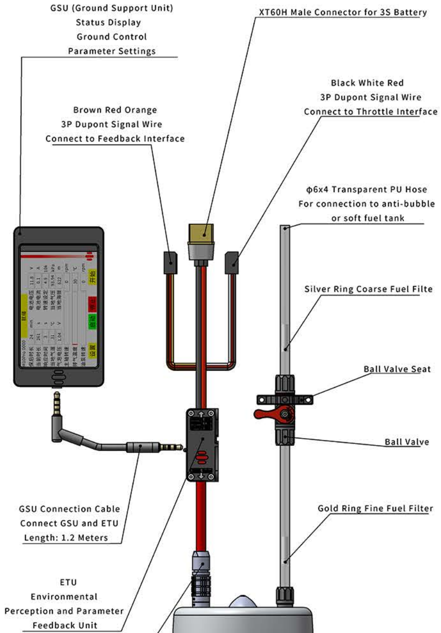
Cut-to-fit for the engine

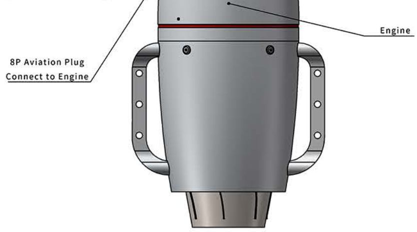
The total length of the oil line from the main fuel tank to the engine shall not exceed 2 meters.

M10Pro UART Communication Wiring Diagram


Connected to the engine
Wire ends are soldered to the relevant interface of the flight controller; wiring length is 1 meter
3.5mm 4-ring connector connected to ETU
GND (Battery ground is connected to the engine housing)
RX (Connected to the RX pin of GSU or flight controller)
TX (Connected to the TX pin of GSU or flight controller)
+5V (Power supply output, load capacity 100mA)
Brown-Red-Orange 3P Feedback Connector
3.5mm 4-ring socket
3S LiPo Battery >2200mAh
ETU (Environment Perception & Parameter Feedback Module)
Black-Red-White 3P Throttle Connector

M10pro Electrical and Fuel Connection Diagram





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Partial Details

Fine sandblasted anodizing process, resistant to high temperatures

3S/12V 20A
Designed & Manufactured

3S/12V 20A
Designed & Manufactu

ONLY Φ6X4mm
MUST USE THE SPECIFIED FILTER ELEMENT

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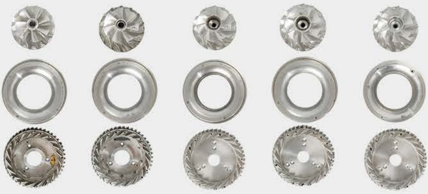
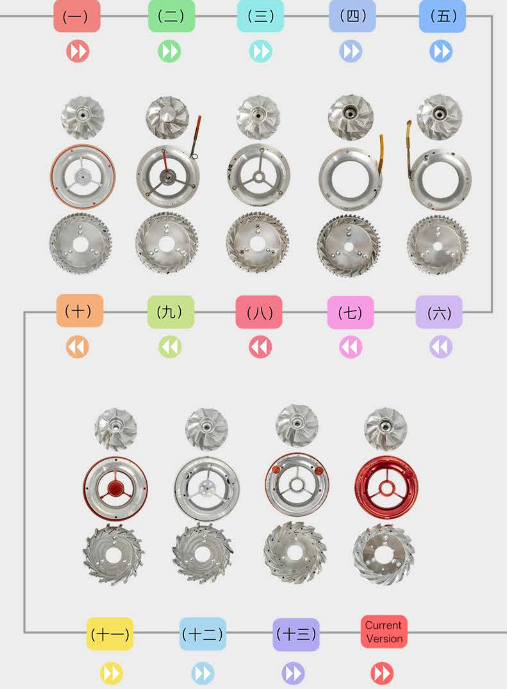
R&D History

R&D History of Selected Components

Compressor Design

The compressor is a critical component of a turbojet engine. It draws air from outside the engine, compresses it, and delivers it to the combustion chamber. The performance of the compressor directly determines key indicators of the engine such as diameter thrust and acceleration performance. During the development of the M10 engine, the compressor underwent 14 major iterations: 11 aerodynamic versions and 3 structural versions, taking a total of 18 months. Our supplier once joked: Can you even tell how many prototypes you have made? The evolution from the initial conventional layout to the final compressor wheel with built-in starter motor layout represents a gradual improvement in design capability, as well as a process of trial and error to find the optimal solution. After investing a huge amount of manpower and resources, the team has accumulated extensive test data and design experience.





Starter Motor Design

The M10 engine series adopts a self-developed integrated built-in starter motor combined with the compressor, sharing the same housing and shaft. This design significantly shortens the axial length of the engine, reduces weight, and eliminates the need for a clutch.

There is a principle in engineering design: the best design is no design. For the M10 engine, reliability is one of the key indicators pursued in the design.

The traditional starter motor with clutch design has many unavoidable defects in application, such as complex structure, slipping, failure to engage or disengage, resulting in starting failures.

To solve the above problems, the best approach is to remove the clutch. Direct driving of the engine rotor by the motor is the most intuitive solution, but it requires the rotor to withstand centrifugal force at up to 150,000 rpm.

The starter motor initially adopted the switched reluctance type, which has no fragile magnets and is resistant to centrifugal force. Tests showed that to achieve the required starting power, the motor was relatively thick and the drive circuit was bulky, which would increase the overall axial length and weight of the engine, making it not worthwhile. Development was then switched to an axial-flux brushless motor, which can be installed under the compressor wheel without damaging the existing aerodynamic design of the compressor, and its performance meets the application requirements. After 4 versions of iteration, the total thickness of the motor is only 3 mm, with stable operation and high starting torque.

However, in subsequent fatigue tests, the axial inlay process of permanent magnets could not meet the strength requirements. When the engine speed exceeded 100,000 rpm, there was a risk of the permanent magnets being thrown off. Once thrown off, they would shatter all parts and structures in their path. This is an unacceptable risk. The R&D team tried to place the magnetic part of the motor in front of the compressor, with the compressor wheel wrapping the magnetic part, forming a built-in starter motor scheme. However, this would damage the existing aerodynamic design of the compressor, requiring a complete redesign of the compressor.

After more than one year of compressor improvement and adaptation, the built-in starter motor has gone through 8 versions of iteration from the feasibility verification of the mechanical part and electronic drive part to mass production.

At present, the built-in starter motor equipped on the M10 series engine features a simple structure with no independent moving parts, stable and reliable performance, and can operate continuously for 10 hours at peak current without damage.

(一) Switched Reluctance, SR

(三) Switched Reluctance, SR

（二）Switched Reluctance, SR

（四）Switched Reluctance, SR

（五）Axial Flux

（七）Axial Flux

（六）Axial Flux

（八）Axial Flux

（九）Outrunner Brushless

（十一）Outrunner Brushless

（十）Outrunner Brushless

（十二）Outrunner Brushless

（十三）Outrunner Brushless

（十五）Outrunner Brushless

（十四）Outrunner Brushless

（Current Version）
Outrunner Brushless

Bubble Sensor

Micro turbojet engines are highly sensitive to fuel bubbles, which can lead to uncontrolled speed drop or even flameout. In-flight flameout is unacceptable for any aircraft engine, as it poses severe risks.

For currently sold 6-12kg thrust micro turbojet engines, fuel pipeline inner diameter ranges from 2.5 to 4.0 mm. At full throttle, maximum fuel flow reaches 400ml/min, with a pipeline flow velocity of 0.5-1.4 m/s. A bubble generated in the fuel tank can reach the engine in about 1 second (assuming a 1-meter fuel pipeline).

Ground testing makes it hard to visually detect bubbles in fast-flowing pipelines (except large or clustered tiny bubbles). Typically, personnel check oil circuit tightness by monitoring engine operation—repeatedly adjusting from idle to full throttle. No flameout or abnormalities confirm a sound oil circuit.

This simple pre-takeoff method often fails to detect early minor oil leaks. Unaddressed leaks risk in-flight flameout, and crash wreckage rarely helps distinguish between oil circuit and engine faults—an outcome we, as manufacturers, strive to avoid.

Even with a sound oil circuit, high-altitude flight reduces fuel surface atmospheric pressure. Combined with fuel suction negative pressure, this can cause air and oil vapor to precipitate in the pipeline—equally harmful to engine stability as oil leaks.

To solve these issues, Little Giant Company pioneered a hardware bubble sensor. We developed multiple schemes (heat flow, orifice differential pressure) and ultimately chose an optical sensor—using light refraction (through media of different densities) to detect bubble quantity.

This optical sensor includes a self-developed ultra-micro folding lens and a pair of infrared emitting/receiving tubes. All components install on one pipeline side (no need for dual-end mounting), enabling installation in extremely narrow spaces (even the engine's oil inlet). This keeps the engine's smooth appearance intact, as no external electrical connections are required.

When the engine runs, the sensor monitors the pipeline, using voltage to indicate bubble size and recording bubble duration. It outperforms previous self-developed sensors in latency, accuracy, stability, manufacturability, and post-processing simplicity.

Limited by volume and cost, it is accurate for qualitative detection (full bubbles or full fuel) but less precise for oil-gas mixtures—though bubble duration recording remains reliable.

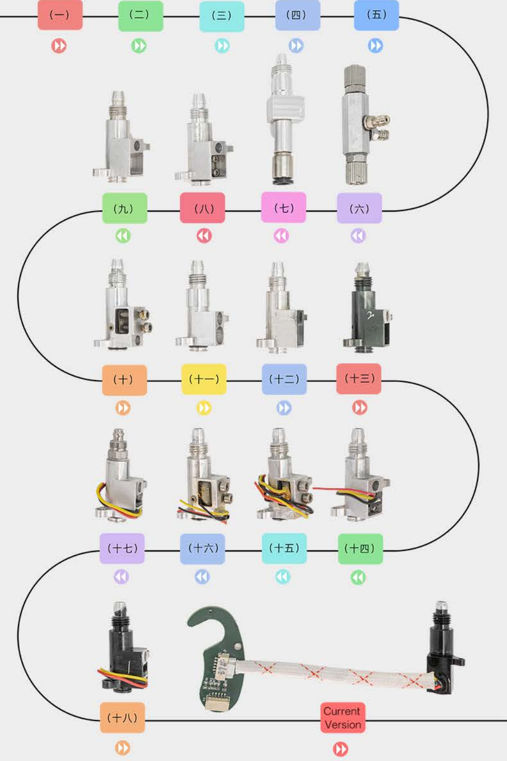
Current engine software supports real-time GSU (Ground Support Unit) prompts and historical data playback of sensor readings. Future updates will connect bubble status to the engine feedback link, allowing pilots to land early when weak bubbles are detected, avoiding greater losses.

This optical bubble sensor consists of an ultra-micro folding lens independently developed by our company and a pair of infrared light emitting and receiving tubes. This allows us to install all components on one side of the pipeline without distributing the infrared pair tubes at both ends of the fuel pipe and passing light through the fuel pipe to achieve detection. This enables the sensor to be installed in an extremely narrow space, even at the engine's oil inlet interface, ensuring that this newly added sensor can be installed inside the engine without the need to place the entire device outside the engine through electrical connections, which would damage the original smooth and elegant appearance lines of the engine.

The software of the currently sold engines supports real-time prompts on the GSU (Ground Support Unit) interface and viewing the sensor's collection status during historical data playback. In the future, we will connect the bubble status with the engine feedback link, allowing the pilot to properly control the aircraft to land in advance when weak bubbles are detected in the sky, so as to avoid greater losses.

However, limited by volume and cost, the sensor is very accurate in qualitative detection of the pipe being completely filled with bubbles or completely filled with fuel. But when detecting the state of oil-gas mixture (both oil and gas), the volume accuracy of the judgment is low, but the duration record is relatively accurate.

The software of the currently sold engines supports real-time prompts on the GSU interface and viewing the sensor's collection status during historical data playback. In the future, we will connect the bubble status with the engine feedback link, allowing the pilot to properly control the aircraft to land in advance when weak bubbles are detected in the sky, so as to avoid greater losses.



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Corporate Honors

科技型中小企业

高新技术企业
证书

国家科技型中小企业

- ◆National Technology-Based SME (People's Republic of China)
- ◆National High-Tech Enterprise (People's Republic of China)
- ◆Technology-Based SME of Mianyang City, China

Selected Patents

A number of patented technologies

Disclaimer

1.Non-Warranty Statement

Mianyang Little Giant Power Equipment Cp., Ltd. provides no warranties of any kind, express or implied, including but not limited to implied warranties of merchantability or fitness for a particular purpose, with respect to the accuracy, completeness or applicability of the information contained in this manual.

2.Exemption of Liability for Information and Use

The Company shall not be liable for any direct, incidental or consequential losses arising from errors in this manual, or from the provision, use or implementation of the contents of this manual.

3.Limitation of Liability for Operation

The Company shall not be liable for any property damage, personal injury or other harm caused by the user's failure to correctly install, operate or use the engine in accordance with the requirements, including but not limited to improper operation. This disclaimer is based on the fact that the Company cannot continuously monitor user operations.

4.User Responsibilities

The user is obligated to fully read and understand all contents of this manual and fully grasp the product features and functions.

The user must fully recognize and assume the inherent potential risks during the operation of the product.

The Company makes no promises or guarantees regarding the performance or functions of the product; the user shall rely on their own professional knowledge and judgment to make decisions on product purchase and operation.

5.Special Flight Safety Tips

Flight Area: When conducting flight activities with the Company's turbojet engines, users must select flight areas that are legally permitted and meet safety standards.

Assumption of Risk: Users must fully recognize the accidental risks involved in flights with turbojet engines and assume full responsibility arising therefrom.

Pre-Flight Inspection: It is strongly recommended to conduct ground simulation tests before each flight to identify potential faults to the greatest extent.

6.System Complexity and Liability Definition

Given that turbojet engines and their mounted airframes constitute a highly complex technical system, the Company cannot accurately predict or cover all specific causes that may lead to failures.

Final Disclaimer: Therefore, except for problems directly caused by

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Explanation of * Marked Items

1.Definition of Long Endurance

The maximum tested single flight time is 2 hours and 40 minutes at a cruising altitude of 5 km.The maximum single operation time during ground fatigue testing under comprehensive working conditions is 5 hours.

2.Definition of High Load

It has been verified through testing that the engine can climb at full throttle continuously for 20 minutes to an altitude of 6 km after takeoff, and then be adjusted to 80% throttle.The engine remains undamaged after 20 minutes of continuous full-throttle operation on the ground.However, this does not mean that the engine can achieve the same performance and remain undamaged under any intake temperature and altitude conditions.

3.Definition of Overload

Axial overload test: For the version equipped with only single-side engine mounting brackets, the engine can work normally when subjected to a maximum ejection and arrest overload of 15 G during operation.

4.Appearance Quality Tolerance of the Complete Engine

The complete engine is allowed to have:4 scratches or manufacturing defects, each with a length no greater than 2.5 mm;or1 scratch or manufacturing defect with a length no greater than 6 mm.