# Research on Micro-navigation and Mechanical Control System of Vector Propulsion Model Helicopter

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**Keywords:** HM helicopter vector propulsion engine control system research

**Abstract:** This paper briefly describes the control system of the RC helicopter vector propulsion engine. The hydraulic control system and electronic control system of the model helicopter propulsion engine control system are analyzed in detail. It also outlines the specific functions and technical requirements of the digital control system in the RC helicopter vector propulsion engine. The research shows that the Chinese model helicopter vector propulsion engine control system should develop and apply the vector propulsion engine controller system to lay the foundation for the development of China's model helicopter vector propulsion engine control system.

With the continuous development of China's RC helicopter technology, control system technology and vector propulsion engine technology, RC helicopter control technology is gradually improving. From the development of the traditional RC helicopter vector propulsion engine control system to the present, people generally use the combination of hydraulic mechanical and electronic control technology, such as the straight 9 vector propulsion engine control system, medium-sized general aircraft model helicopter control system. Due to the continuous intervention in the new era, the mission profile of the RC helicopter is further expanded and higher requirements are imposed on the RC helicopter vector propulsion engine control system. In order to meet the development needs of the RC helicopter vector propulsion engine system, control the vector propulsion engine is more accurate and less burdensome to the driver, especially in the military aircraft helicopter combat period. The modern model helicopter vector propulsion engine needs to use a digital electronic control system. This paper mainly studies the RC helicopter vector propulsion engine control system, the specific analysis is as follows[1].

## 1. Current Status of Domestic RC Helicopter Vector Propulsion Engine Control System

At present, China's own research aircraft model helicopter propulsion engine control system usually uses mechanical hydraulic control system, for example, the vector propulsion engine of the straight type 8 model helicopter wz6, the straight type 9 model helicopter WZBA vector propulsion engine, etc. Etc., the mechanically operated hydraulic fuel regulator is used to control the size of the regulator throttle to ensure the power and state of the vector propulsion engine. The mechanical hydraulic control system has certain advantages for controlling the uni variate and range of the RC helicopter and also has high safety and reliability and good economy. With the development of RC helicopters in China, RC helicopters are also widely used in mechanical hydraulic control systems. In this regard, the relevant development departments have accumulated a lot of experience[2]. With the gradual improvement of China's HM helicopter technology, it is necessary to meet the needs of social development in the improvement process. Therefore, the traditional mechanical hydraulic control system has not met the requirements of the RC airplane vector propulsion engine control system in the new situation. The insufficiency of the traditional mechanical hydraulic control system is embodied in the following: the variable range of control is narrow; the control speed is slow and the fire control system performs comprehensive control. The control system of the RC helicopter vector propulsion engine is currently using a full-featured digital electronic control system, which can reasonably promote the further development of the turbo-axis digital control vector propulsion engine system technology in China and promote the AE airplane helicopter to be

  DOI: 10.25236/isrme.2019.101

easier in flight preparation. It can reduce the burden of RC helicopter pilots and can effectively improve the agility and maneuverability of RC helicopters. It can also ensure a stable platform for armed RC helicopters and establish a solid foundation for China RC helicopter vector propulsion engine integrated control system. At this stage, China's Straight 8, Straight 9 and other RC helicopters are widely used in the process of dressing, full-featured digital electronic control technology. The RC airplane vector propulsion engine under study uses full-featured digital electronic control technology and is also designing an integrated RC helicopter vector propulsion engine system to finally realize an integrated control RC helicopter vector propulsion engine control system.

## 2. Technical solution of RC helicopter vector propulsion engine control system

The RC helicopter vector propulsion engine digital control electronic system includes: fuel pump; fuel metering device; temperature, speed, pressure, flow and other different sensors; actuator and digital electronic controller. The RC helicopter vector propulsion engine is organized by a fuel management module and an electronic controller[3]. The main functions of the RC helicopter vector propulsion engine digital control technology are: realization of vector propulsion engine automatic start and automatic stop; functional state control; speed constant speed control power turbine and other scientific control systems. The current RC helicopter vector propulsion engine digital system structure is divided into two types: one is a dual-channel full-function digital control system, mechanical hydraulic backup operation; the other is a single-channel full-function digital control system with mechanical hydraulic backup Manipulation. The full-featured number of RC helicopters under study in China is the single-channel control system plus hydraulic backup operation of the control system and outlines the typical digital control technology scheme for RC airplanes.

### 2.1. Control Requirements for Automatic Control Mode

First, control the RC airplane vector propulsion engine power state. The RC helicopter vector propulsion engine state control is controlled by a management switch mounted on the control panel. The switch signal is output to the electronic controller and three control states can be set to stop, slow and fly. When the management switch is adjusted from the parking to the local position, or from the parking to the flight position, the RC helicopter can be started automatically; in order to realize the management switch setting to the flight position, it is necessary to go through the local train to the parking position to realize the parking. In such a case, the RC helicopter vector propulsion engine caused by the airborne error operation can be avoided from stopping in the air[4]. Automatic control requirements are shown in Figure 1.

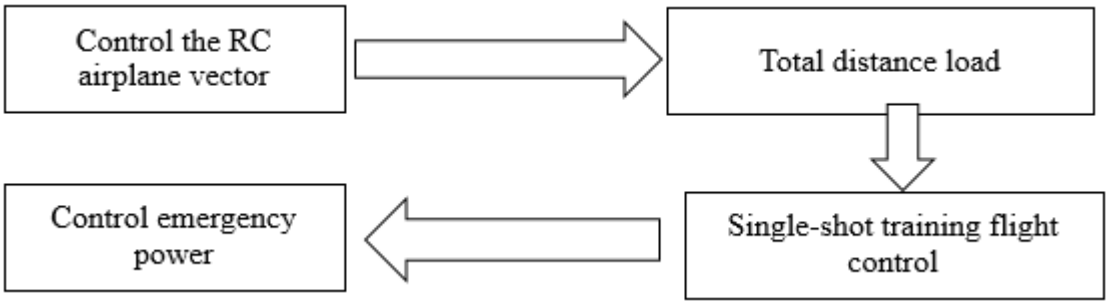


Figure 1 Automatic control requirements

Second, the total distance load is a power control. A sensor is arranged at the lower part of the RC helicopter. The sensor is set at such a position to transmit the signal to the electronic controller and the load of the steered propeller is compensated in advance for the load change of the rotor, thereby reducing the rotational speed of the rotor. Improve the response state of the vector propulsion engine.

Third, single-shot training flight control. Strengthen the training of pilots' flight technology to

ensure that pilots have the ability to handle themselves when they encounter a fault during flight. When selecting a model helicopter that needs to fly, the maximum power used by the vector propulsion engine needs to be based on the unit's emergency power and the set power is not greater than the takeoff power. It is not the vector propulsion engine that the unit chooses to fly and to some extent, it will automatically select the standby state with less power. The electric control panel in the cockpit can be equipped with a switch that trains the aircraft in such a way as to control two vector propulsion engines[5].

Fourth, control emergency power. If, when a vector propulsion engine has a sudden drop in power, another vector propulsion engine automatically enters the maximum emergency power, the vector propulsion engine that automatically enters the maximum emergency power enters the work or ends. After work, the flight should be carried out according to the time period allowed by the reduced power. When the pilot is able to control the flight of the aircraft autonomously and the vector propulsion engine is not allowed to enter the maximum emergency power, the emergency control switch can be fully utilized to achieve the purpose. For example, the automatic setting switch and the limited setting are two different positions. During the setting process, the automatic setting can realize the vector emergency engine entering the maximum emergency power state and the limited position means that the allowed power cannot exceed the limited range.

### 2.2. Automatic control system display scheme

The vector propulsion engine control system display system is organized from the parameters and display of the vector propulsion engine. When the vector propulsion engine digital electronic controller is in operation, the RC helicopter's vector-propelled engine parameter integrator can reasonably utilize the electronic controller to accept the data of the vector propulsion engine, including the vector propulsion engine. Key faults, non-key faults, status information, etc., in a certain song base, can also directly deal with the oil temperature, pressure, fuel temperature signal of the vector propulsion engine. The vector propulsion engine parameter collector communicates with the display via the backup RS422 simplex serial port.

### 2.3. Manual control mode function and control requirements

In the event of a failure of the vector propulsion engine digital electronic controller, a separate backup mechanical hydraulic operating system can be used to continuously control the vector propulsion engine. The mechanical hydraulic control system is derived from the structure of the soft push-pull cable and the steering throttle mechanism. In the normal working state, the throttle lever is not linked with the operation, but is set in the throttle neutral position and the backup switching of the fault condition is gradually improved. The vector propulsion engine can also utilize the starting point of the power to be automatically The control is switched to manual control to reduce the drop in instantaneous power. Control error is shown in Figure 2.

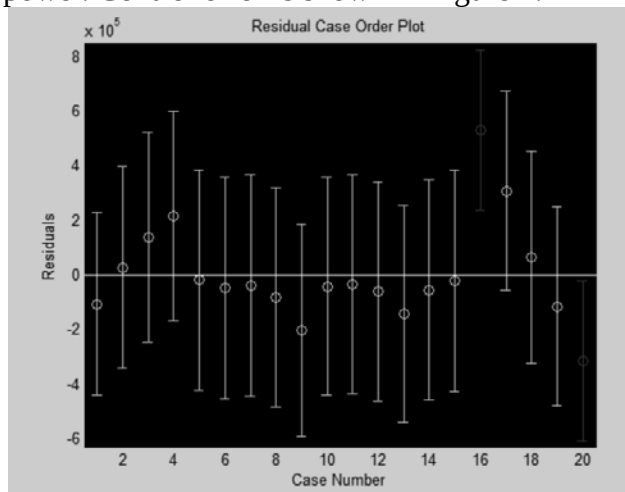


Figure 2 Control error

## 3. Conclusion

All in all, the mechanical hydraulic control system of the HM helicopter vector propulsion engine full-function digital control system has an irreplaceable advantage. It can not only realize the power of the control vector propulsion engine, but also realize the management that the mechanical hydraulic control system does not have. Features. It also has measures such as margin control, fault detection, display, suppression, automatic monitoring and detection, fault isolation, safety loop, etc., to some extent to improve the reliability of the vector propulsion engine control system to the greatest extent. In the development of the RC helicopter vector propulsion engine control system, the vector-push engine full-function digital control system will provide the correct development direction in a timely manner and realize the integrated control of the RC helicopter flight control system in a real sense.

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