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"Red Bird Collaborative" Fighter Design

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Abstract: The main purpose of this project is to design an unmanned aerial vehicle that can cooperate with the main engine in the future. The unmanned aerial vehicle must have the following physical characteristics: detectable, cooperative flight, super maneuverability and other general characteristics [1]. The design of the aircraft mainly highlights the future. The characteristics of high-precision strikes against enemy aircraft in warfare. The performance of UAVs is optimized and innovatively designed. The aircraft mainly relies on the transmission sensor on the head to accelerate and hover around the enemy aircraft in a short period of time to seize the initiative in air combat [2]. Right to protect the host and destroy the enemy aircraft. In the future, this type of fighter will become Universal design direction.

1. Demand analysis

With the advent of the intelligent era, highly intelligent weapons emerge in endlessly, and many military powers hope to master the dominance of future wars through advanced technology. Military UAVs are high-performance, high-information weapons, and are a great embodiment of the development of modern information technology in the military. Make improvements on the basis of existing advanced fighters, continue to innovate and improve future intelligent collaborative drones, and design them to perform escort missions for bombers and large transport aircraft, perform difficult combat missions, and protect the host from Interfered by the enemy's insecurity in the air.

2. Overall design

After CATIA modeling, import the overall layout view of the aircraft in 3Dmax as shown in the figure below. Then mark the "Red Bird fighter" fighter in three views.

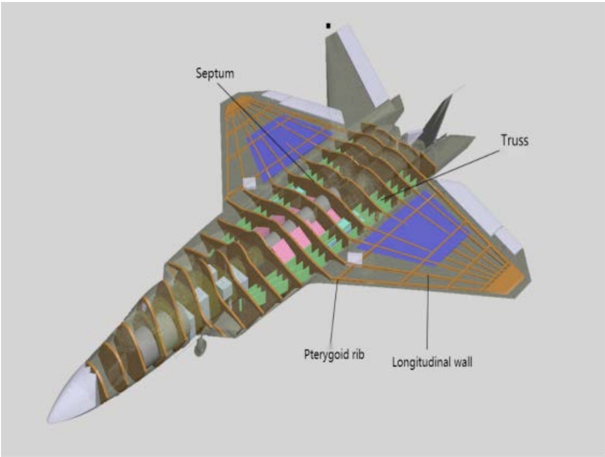

Figure 1: Internal frame illustration

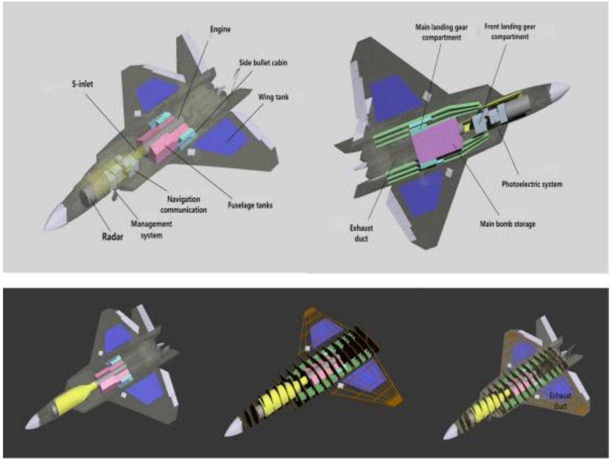

Figure 2: Internal frame

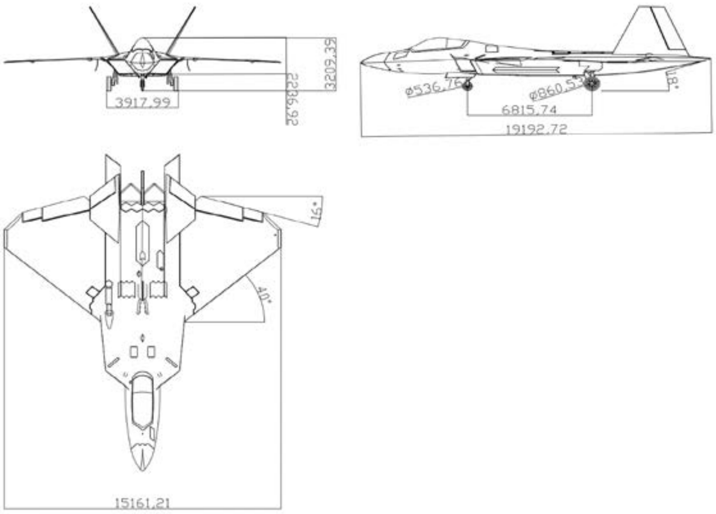

Figure 3: Three views of the Red Bird fighter

2.1 Overall plan

General structural design overview: For cost considerations, the aircraft structure uses ordinary alloy materials; for full-moving wingtips with higher strength requirements, composite materials such as carbon fiber-epoxy are used [3].

Analysis of the design of the fuselage structure: the multi-frame design is adopted, and the reinforced frame is used at the connection between the fuselage, the wing and the tail wing, and the rest are ordinary frames to ensure sufficient strength of the fuselage.

Wing structure design analysis: The multi-wall layout is adopted, which has high carrying capacity and load transfer efficiency, so that the aircraft has good aerodynamic shape conditions.

Tailless layout: First, the weight of the aircraft can be greatly reduced; secondly, the aerodynamic drag of the aircraft can be more significantly reduced due to the cancellation of the tail wing.

2.2 Power plan

According to the performance analysis that the aircraft needs to meet, the most advanced F135 engine in China can be used to meet the needs of the aircraft. By setting the flying Mach number at a certain altitude during the descent process, and given the hovering height and the hovering Mach number, the hovering performance curve is obtained [4]. Then use the estimation method to calculate the data of the corresponding point, and get the relationship diagram of the Climb performance as shown in the figure below.

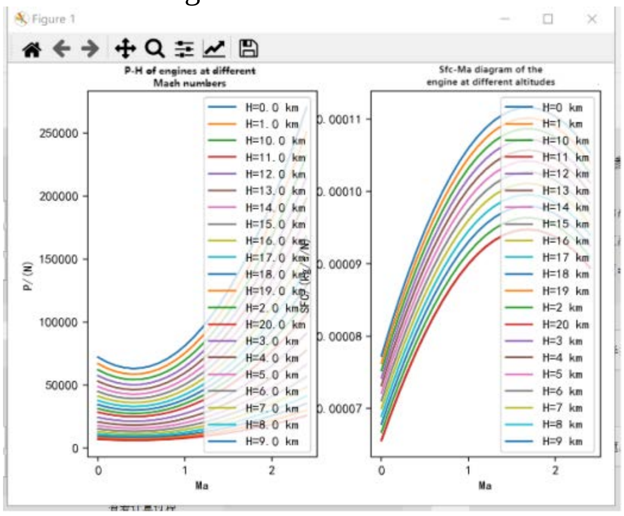

Figure 4: Engine performances

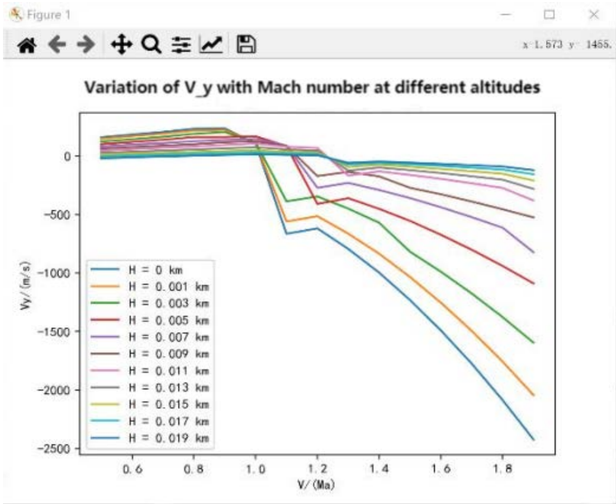

Figure 5: Climb performance

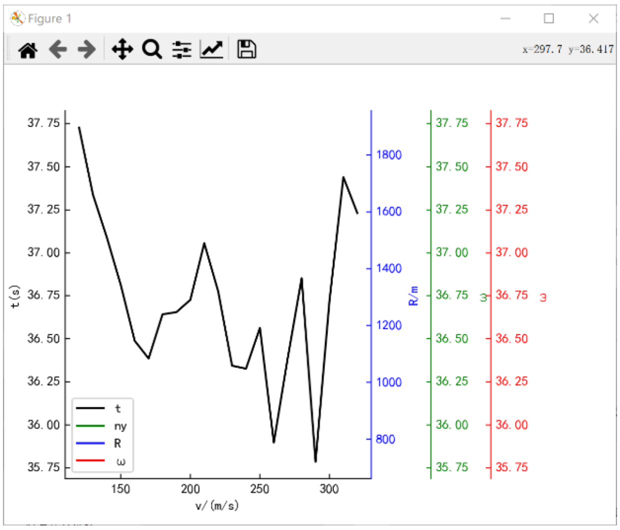

Figure 6: Circling performance analysis

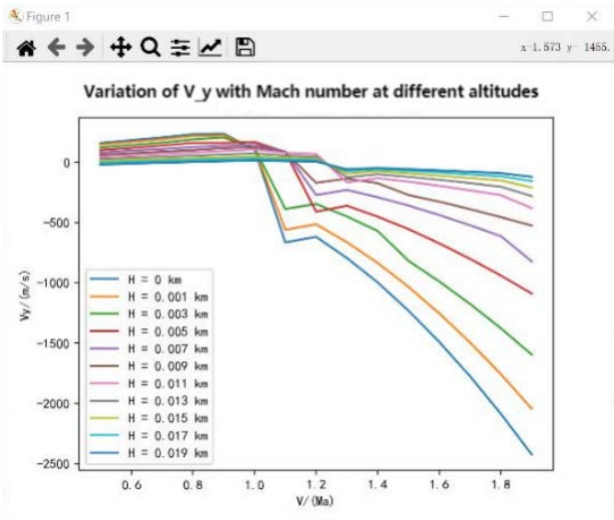

Figure 7: Maximum climb rate

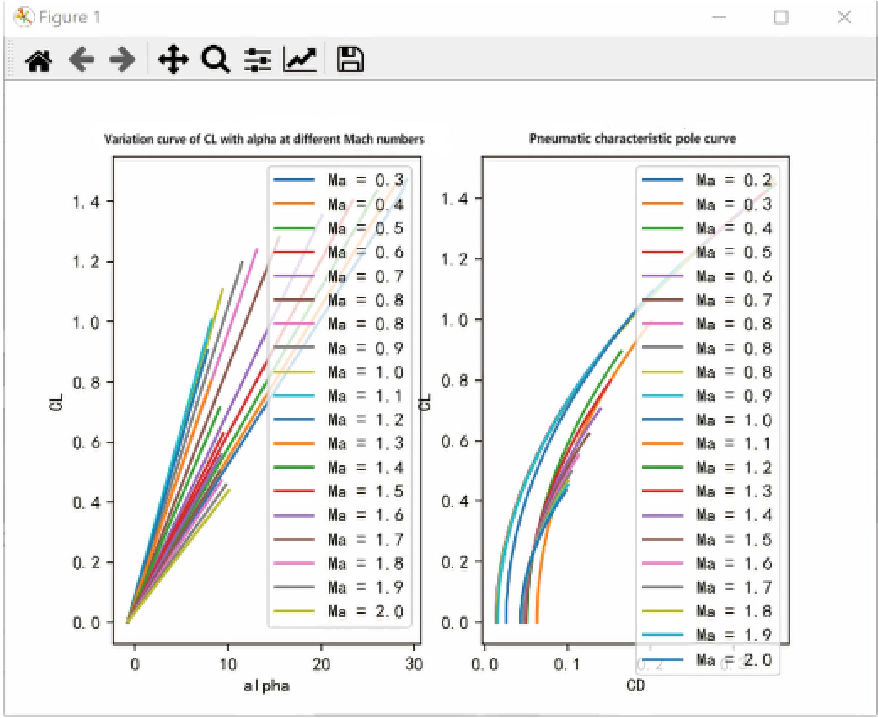

Figure 8: Aerodynamic characteristic curve

From the altitude graph, the maximum climb rate is 250m/s, and the corresponding speed is 290m/s, which is the maximum when the altitude is 0.

2.3 Cruise performance

By setting the available fuel mass for a given cruise section to 4000kg, the initial mass of the cruise is estimated to be 21569kg. And calculate the maximum range of 825.6km at 10km, the cruise time is 0.77h.

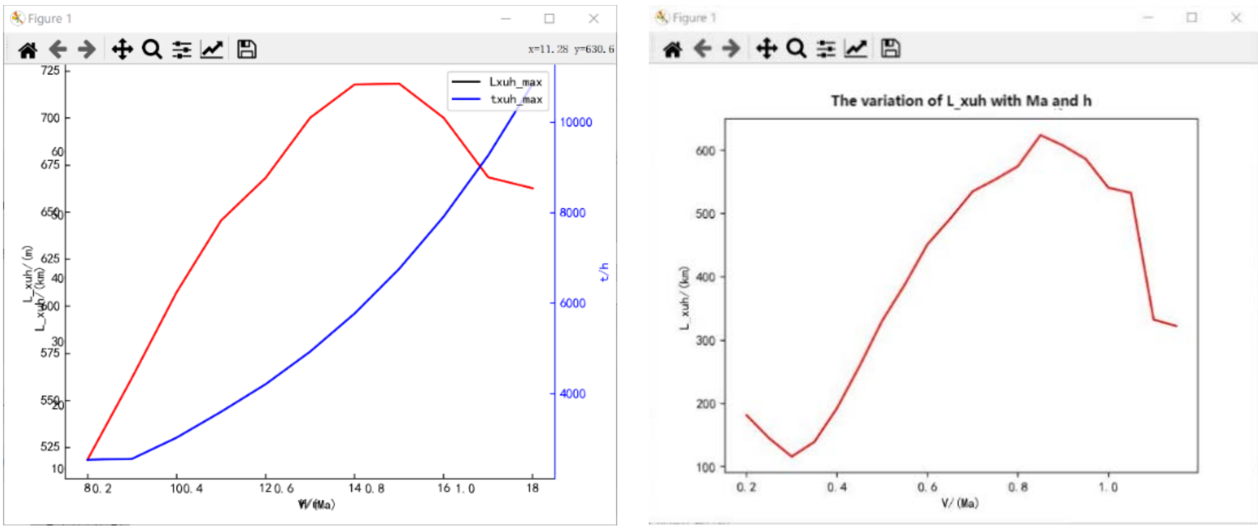

Figure 9: Cruise performance

2.4 Stealth performanc

The importance of stealth is self-evident. It is an important indicator of combat performance in modern warfare and an indispensable part of aircraft design. Here we use the official RCS calculation software to calculate the stealth performance, and design the following parameters to get the RCS distribution curve.

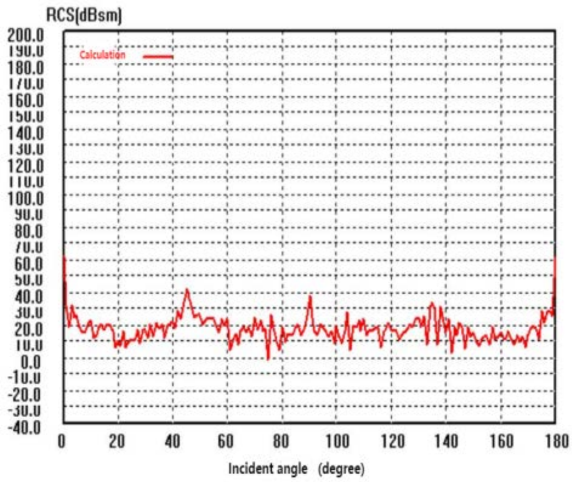

Figure 10: Parameter setting

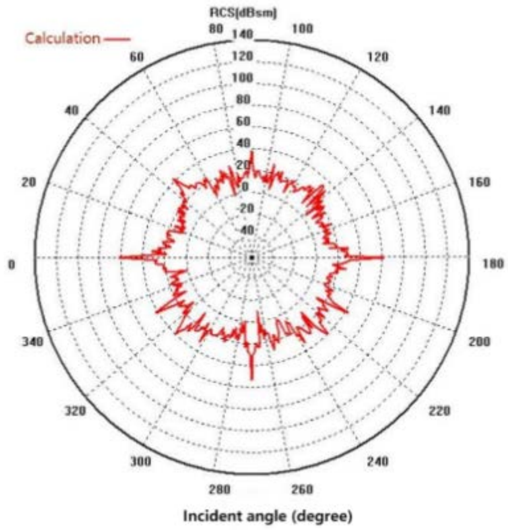

Figure 11: RCS polar coordinate curve

3. Innovation and advantages

1. The Red Bird fighter is an unmanned fighter aircraft with a high level of intelligence. The Red Bird fighter has an excellent intelligent command system, which can effectively complete target search, tracking and attack.

2. The Red Bird fighter has excellent maritime strike capabilities. When the Red Bird fighter flies close to the sea and goes deep into the enemy's internal operations, when it is discovered by the enemy, it will adjust its combat mode in time. At this time, it can dive under the water and carry out corresponding military strikes.

3. The Red Bird fighter is a "violent" fighter. When the fighter encounters a major crisis, the Red Bird fighter will take a suicide attack to reduce the damage to the host or for the victory of the entire battle. When the host is facing a major threat, the unmanned combat opportunity receives the signal the first time, and responds accordingly, and even self-destructs.

4. The host can make full use of the intelligence and comprehensive judgment capabilities of the UAV to eliminate interference and drive its own combat aircraft or command the UAV to conduct combat attacks under complex conditions.

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