

# *Review of Research on Ducted Air Tube Propeller Lifeboats*

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**Abstract:** As the state of marine pollution has continued to strengthen in recent years, there has been a ducted air propeller lifeboat on the market, which mainly deals with the deterioration of marine ecology. This article mainly introduces the characteristics and application prospects of ducted air propeller lifeboats research and discussion on power, use, environment, and market prospects.

## 1. Introduction

The propeller of a modern ship is generally located at the bottom of the ship, but when the propeller is located at the bottom of the hull, there are many disadvantages: it is too noisy for marine life, it is easy to be caught in fishing nets or floating marine plants during navigation, which leads to the propeller. Stopping the movement makes the hull unable to continue sailing. Under the environment of high fish concentration, the propeller can easily cause damage to marine life and damage the marine ecological environment. In order to avoid the above problems, strengthen the protection of marine ecological civilization and improve the development level of fisheries. In response to the call of marine powers, a survival vessel based on ducted air propellers appeared on the market. The ducted air propellers replaced traditional underwater propellers. This vessel can well avoid the generation and spread of noise, and also reduce the impact on marine life. This article reviews the characteristics and application prospects of this ducted air propeller lifeboat.

## 2. Features of Duct Air Propeller Lifeboat

### 2.1 Power system upgrade

Based on the aerodynamic principle, the thrust of the air propeller and the force of the rudder plate are calculated. The internal combustion engine on the hull is used to drive the two-bladed or three-bladed propeller to rotate and the top vortex generated in the air produces a backward effect. Force, when this force is greater than the friction of the hull itself [1], the pneumatic boat will move forward. Air propellers are used instead of ordinary underwater propellers, letting air act as a forward force, and water movement becomes pneumatic. There may be situations where the vehicle cannot move forward due to insufficient power. At the same time, it is also possible to land directly

from the sea or directly from the land into the sea. The ship starts and lands quickly, and the power system is strong, so the starting speed, sailing speed, and landing speed are all significant improvement. The powerful power system also greatly improves the speed when turning, the rudder is located in the air flow at the stern of the ship, and the control is very flexible. It can achieve 360° rotation in situ regardless of the water or the harsh environment.

## **2.2 Versatile use**

The ducted air propeller ship has significant application advantages in wetland exploration, tourism, and environmental protection operations due to its simple structure, high trafficability, and unique aerodynamic and hydrodynamic characteristics. This ship it can overcome the difficulty of rescue when there is a flood, there are many foreign bodies or debris, shallow water level, complicated waters, etc. It can realize maneuver forward in any water, thereby reducing the work intensity of search and rescue personnel and improving. In addition, when Marine public security personnel are conducting salvage operations, the ship can safely move forward when encountering complex situations such as thin ice or ice on the surface and mixing with water, such as wetlands and marshes, dense reeds and weeds. But the ordinary ship has no way to pass through or enter these areas salvage operations.

## **2.3 Different hull types**

As the hull of the ducted air propeller ship is a flat bottom, unlike the traditional u-boats and v-boats in the past, this boat has no propellers and no extra appendages below the waterline, which can ensure that the ship can navigate in areas of water, shoals, and mud where there are a lot of algae and impurities. In non-surface navigation, the weight of the ship is balanced with the sliding hydrodynamic force, allowing the ship to slide at a high speed [2]. Compared to traditional rescue methods, ducted air propeller ships it has irreplaceable characteristics, fast speed and good trafficability.

## **2.4 Easy towing and transportation, not afraid of losing power**

The aero-powered boat is simple in structure and light in weight, which saves manpower and material resources when towing and transporting. At the same time, because the power of the boat comes from air, as long as there is air, it can propel the ship forward, and there is no fear that conventional ships will run out of fuel.

# **3. Application of ducted air propeller lifeboat**

## **3.1 Disaster relief, efficient rescue**

In the event of a flood, there are many problems such as foreign debris and shallow water levels, and complex waters. This ensures that the vehicle can be driven in any water, reducing the labor intensity of rescuers and improving the efficiency of rescue. The collision and the damage caused by the hull caused the secondary disaster, thereby improving the anti-collision ability and ensuring the safety of personnel. Applying to flood rescue will improve the efficiency, shorten the rescue time, and save more lives.

At present, the public security personnel on the water are inaccessible and inaccessible during salvage operations; thus, in complicated situations such as swamp wetlands, reeds with more waterweed, thin ice, and mixed ice and water, ordinary ships cannot pass through or enter the waters.

Rescue operation. Compared with the traditional rescue method, the aero-powered boat has an irreplaceable point, fast speed and good trafficability.

### **3.2 Tourism, Adventure, Maintenance**

As the development trend of the tourism industry is getting better and better in recent years, wetland sightseeing has gradually become popular. Between ordinary ships in the past, it is almost impossible to move in a muddy wetland environment, but the ship does not have to worry about underwater obstacles. The higher mudflats in shallow water can also be jumped over. Tourists can enter the wetlands to watch the wetlands to protect the animals. They can get a closer understanding of the animals' life and work and rest, and increase the wetland tourism industry. Further enhance the wetland culture. When encountering unknown wetlands or shoals, the ship can overcome most of the harsh underwater conditions and provide people with a guarantee of adventure. Also in the maintenance of wetland power lines [3], Able to solve problems in a more timely and accurate manner than in the past.

## **4. The future of ducted air propeller lifeboats**

### **4.1 Domestic government support and encouragement**

Hu Chunhua, member of the Political Bureau of the Central Committee of the 14th China International Small and Medium Enterprises Fair in 2018, Secretary of the Guangdong Provincial Party Committee, Miao Wei, Minister of the State Ministry of Industry and Information Technology, Ma Xingrui, Governor of Guangdong, and Fang Chunming, Deputy Governor of Anhui, The "air ecological life-saving vessel" had a deep understanding, carefully listened to the detailed introduction of technical staff, and encouraged us to make persistent efforts and increase scientific research to fill the gaps in the domestic industry. Therefore, one of the key directions for the transformation and upgrading of China's shipbuilding industry. The first is a high-speed pneumatic ecological boat [4].

### **4.2 Large potential market, bright future market**

In the field of fisheries, first of all, the cost of high-speed ecological boats is relatively low, which is easily accepted by fishermen. With a low cost, it also avoids the threat of propellers to marine life, which can bring high commercial profits.

In the field of ecological protection, when patrolling endangered protected animals, it can protect endangered marine life more safely without worrying about being killed by the propellers. Protecting the ecological environment, green and pollution-free, light and fast.

In the military field, when the marine emergency rescue encounters a complex sea environment, it can easily overcome the complex water surface without interfering with the operational efficiency. At the same time, when it encounters an emergency and pursues the invaders, it can start directly from the shore at high speed and go straight The sea can also turn quickly on the way, saving steering time, greatly improving the disadvantages of slow turning, slow starting speed and difficult navigation on the water.

In the field of entertainment, it is suitable for extreme experiences on the water surface and snow and ice sports in winter.

In many European and American countries, air propellers have been used in many fields such as disaster relief, field operations, adventure, entertainment, tourism, and competition, while China's air propeller lifeboats have fewer application fields and less mature technologies. Therefore,

domestic air Propeller lifeboats will have a lot of room for development [5].

## 5. Conclusion

This article mainly introduces the characteristic application of the ducted air propeller lifeboat, and compares the market development prospects of the ship in Europe and the United States. The practical value of the ship is described in detail from various aspects and fields. Compared with the ducted air propeller lifeguard in China, The research and development of the ship has just begun, and in the future, a lot of energy needs to be invested in research and design.

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