

Small air turbine

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The Ram Air Turbine (RAT) is a crucial component in modern aviation, providing emergency power and hydraulic pressure in the event of an aircraft system failure. This article delves into the intricacies of the RAM, exploring its design, applications, and the role it plays in various aircraft. We'll also discuss the leading manufacturers of RAM Air Turbines and compare their offerings. [Read Daily Blog Articles](#)

A Ram Air Turbine (RAT) is a small, retractable turbine that generates power using the flow of air as the aircraft moves through the atmosphere. When deployed, it converts the kinetic energy of the air into mechanical energy, which can then be used to drive hydraulic pumps or generate electrical power. This capability is especially vital in emergencies when the primary power systems fail.

The primary function of a RAT is to provide backup power and hydraulic pressure to critical systems on the aircraft when the main power sources are unserviceable. This can happen during a total loss of electrical power or hydraulic system failure. In such scenarios, the RAT helps maintain essential functions, such as flight controls and essential avionics, ensuring the aircraft can still be controlled and safely land.

The RAT is typically deployed automatically when certain thresholds are met, such as a loss of electrical power or a significant drop in hydraulic pressure. However, it can also be deployed manually by the flight crew if needed. Once deployed, the turbine spins as air flows through it, generating the necessary power to support the aircraft's systems until normal power is restored or the aircraft can land.

The RAM is utilized in emergency situations, primarily when there is a complete failure of the aircraft's primary electrical or hydraulic systems. Such failures are rare but can occur due to various reasons, including mechanical failure, electrical issues, or external factors like bird strikes or lightning strikes. The RAT provides a vital backup, ensuring that the aircraft remains operational and safe under adverse conditions.

For example, if an aircraft experiences a dual engine failure or a catastrophic failure of its main hydraulic systems, the RAT can deploy to provide enough power to maintain critical systems like flight controls and essential avionics. This backup is essential for safe flight management and for ensuring the aircraft can be landed safely even in the event of significant system failures.

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Airbus incorporates Ram Air Turbines in several of its aircraft models, including the A320, A330, and A350 series. For instance, the Airbus A320 family features a RAT that provides emergency power and hydraulic pressure to critical systems. This inclusion is part of Airbus's commitment to safety, ensuring that their aircraft can continue operating safely in the event of a power failure.

Similarly, Boeing aircraft, such as the 737, 767, and 777 series, also feature Ram Air Turbines. The Boeing 777, for example, is equipped with a RAT that activates during emergencies to ensure continued operation of essential systems. This feature is a testament to Boeing's dedication to incorporating advanced safety technologies in their aircraft designs.

The primary mechanical component of a RAT is the turbine itself. It is a small, robust rotor that spins as air flows over it. This spinning motion is converted into mechanical energy, which is used to drive hydraulic pumps or generate electrical power. The turbine is designed to withstand high-speed airflow and various environmental conditions, ensuring reliable performance during emergencies.

Additionally, the RAT includes a deployment mechanism that ensures the turbine extends and locks into place when needed. This mechanism can be activated automatically or manually, depending on the aircraft's design and the nature of the emergency.

In terms of electrical components, the RAT is often integrated with an electrical generator or alternator. This generator converts the mechanical energy produced by the spinning turbine into electrical power, which can then be used to power critical avionics and electronic systems. The electrical output from the RAT is typically used to support essential functions like communication systems, navigation equipment, and other avionics.

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