

Cooling of Exhaust Gases Emitted Into the Atmosphere as the Possibility to Reduce the Helicopter Radiation Emission Level

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Abstract : Every material body that temperature is higher than 0K (absolute zero) emits infrared radiation to the surroundings. Infrared radiation is highly meaningful in military aviation, especially in military applications of helicopters. Helicopters, in comparison to other aircraft, have much lower flight speeds and maneuverability, which makes them easy targets for actual combat assets like infrared-guided missiles. When designing new helicopter types, especially for combat applications, it is essential to pay enormous attention to infrared emissions of the solid parts composing the helicopter's structure, as well as to exhaust gases egressing from the engine's exhaust system. Due to their high temperature, exhaust gases, egressed to the surroundings are a major factor in infrared radiation emission and, in consequence, detectability of a helicopter performing air combat operations. Protection of the helicopter in flight from early detection, tracking and finally destruction can be realized in many ways. This paper presents the analysis of possibilities to decrease the infrared radiation level that is emitted to the environment by helicopter in flight, by cooling exhaust in special ejection-based coolers. The paper also presents the concept 3D model and results of numeric analysis of ejective-based cooler cooperation with PA-10W turbine engine. Numeric analysis presented promising results in decreasing the infrared emission level by PA W-3 helicopter in flight.

Keywords : exhaust cooler, helicopter propulsion, infrared radiation, stealth

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