Design of an Automated Damage Inspection System for Aircraft Wheel Hubs

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The wheel assembly is one of the most critical parts of an aircraft. Landing, take off and taxi operations generate repetitive stresses on the wheel hubs, resulting in small imperfections or damage that can potentially grow into cracks. These cracks may cause catastrophic failures that harm the passengers' lives. At present, the Sri Lankan aviation industry uses handheld eddy current inspection equipment for aircraft wheel hub inspection. The handheld inspection method reduces the accuracy of the testing. This study proposes a design of a pre-coordinated eddy current inspection mechanism using Arduino programming. Component Maintenances Manual (CMM) provides by the aircraft manufacture describes the standard inspection methodology of the wheel hub. According to the CMM, the beading area of a wheel hub should be thoroughly inspected as the beading area has repetitive stress concentration. The inspection is done by the rotating wheel hub on a rotary table, and placing a scanning probe on the surface at the top of the bleeding area gradually moves down the probe in 2 mm steps. When the machine operates, there is relative motion between the wheel hub and the moving arm. In order to reduce the moment of inertia, the tray rotates at 50 RPM. On the assembling step, a collision check was done on mates. The time for each wheel hubs with change concerning the size of the wheel hub. If someone chooses the wrong size, the probe might be damaged so, safety switches have been installed on the moving arm as a safety feature. The proposed design was aimed to inspect four types of wheel hubs (wheel sizes: A330 (main and nose wheel), A320 (main and nose wheel). These sizes have been coded on the Arduino code. The proposed design will facilitate high accuracy, time-efficient, and low-budget NDT inspection operation.

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