

## A connected washer providing contactless control over nut tightening in aero engines

*JPB Système has teamed up with Cetim to meet the needs of the aeronautical industry by reducing the time aircraft need to spend on the ground checking that nuts are properly tightened.*

### Supporting Innovation

Significant progress has already been made in contactless control over nut tightening in the nuclear industry and rail transportation in a context of vibrations and sharp changes in temperature. However, in the aeronautical industry, JPB Système is pioneering a similar solution for aircraft engines that combines simplicity, speed and accuracy. The company, which is already a leader in self-locking nuts, has leveraged its in-house operational expertise of the Internet of Things (IoT) to come up with a connected washer that is resistant to electromagnetic interference and displays the required torque in just one second. Measurement accuracy to within 6% may be obtained from 10 cm away, whereas an operator using a traditional method achieves 10% at best. Such performances significantly reduce the time for which aircraft are out of action performing checks on their engines.

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### The client needs

JPB Système is a young family-owned business, created specifically to come up with secure nut tightening solutions for leading aero engine manufacturers. Beginning in 2009, the SME began innovating and robotizing its production processes and making them self-adaptive by harnessing technology such as the Internet of Things (IoT). Its ability to rapidly turn out a range of customised, affordable fixing or sealing solutions has allowed the business to grow rapidly and move into the international market. To come up with a solution that provides quick and accurate contactless checks over nut tightening, JPB Système's teams leveraged all their experience of the IoT as well as acquiring new expertise. In particular, strain gauges were inserted into washers in partnership with the Carnot Cetim mechatronics resource centre. The Company was able to harness all of Cetim's human and technical resources to prove the effectiveness and performance levels of its connected washers. Aside from technological considerations, Cetim was able to tap into JPB Système's corporate DNA by helping to maintain the degree of responsiveness to, and the fit with end user needs.

### Partnership

The Carnot Cetim Institute partners businesses in the mechanical engineering sector, particularly where a high level of mechatronics expertise is required. Mechatronics incorporates the electronic systems that are so indispensable to the intelligence embedded in mechanical engineering equipment. These can then be linked to service functions. This mechatronics expertise has enabled Cetim teams to partner the development of a washer that actually helps to mechanically tighten nuts. In particular, to measure torque, it was necessary to produce a machined test body to position the strain gauges while integrating the communication device. The reader developed by the JPB Système teams is installed on a laptop placed a few centimetres from the nut. The screen takes just one second to display the axial tension measured by the washer, which is remotely powered by a passive system to eliminate all electromagnetic interference. A first 12 mm diameter washer was presented at the 2019 Salon du Bourget trade fair. Over the coming months, work will be performed to optimise the electronic systems and enable the partnership to market washers of different diameters. JPB Système is meeting the challenge of measuring required torque at any given time for one of its customers.