

ABSTRACT

A stand-alone wireless Data System for flight acquisition of helicopter rotating components.

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Objective

To implement a stand-alone wireless Data System for the flight acquisition of helicopter rotating components when conventional Slip Ring is not applicable or too much expensive.

Content and main results

Concerning with the acquisition of rotating parts, slip ring is still one of the most used solutions, particularly for its component compactness, cost effectiveness and reliability.

However, in some specific cases, the use of the slip ring could be prevented by other structural installations or could not be cost effective if only a limited acquisition activity (reduced number of parameters to be acquired) has to be performed.

In these particular conditions a possible valid solution could be the implementation of a wireless data acquisition system. Generally speaking, wireless is certainly one of the most promising techniques for the future data system, even if nowadays this technology still needs further developments in order to improve the technical performances and reduce costs. Nevertheless, some wireless commercial solutions are available off-the-shelf and can be partially customizable for specific industrial application.

The *mast vibration absorber (MVA)* is a dynamic system installed on the main rotor hub, rotating with it, having the objective of reducing the in-plane components of the vibratory loads transferred to the fuselage and providing improvements in terms of flight comfort for the occupants.

A development campaign, set up with a prototype version of *mast vibration absorber*, has been performed in order to verify the effectiveness of *MVA* in terms of loads/vibration level reduction.

Since *MVA* installation was not compatible with slip ring mounting, an alternative solution for transmitting the signals from rotating to non-rotating system had to be implemented: the selected solution was The SG-Link® wireless strain node of MicroStrain's Agile-Link™ wireless data acquisition. The Agile-Link™ system comprises 3 main components:

- 1) wireless sensor nodes which acquire and transmit strain, voltage, temperature, acceleration and/or other sensor data,
- 2) base station which receive and pass the data to a host, and
- 3) software which operates the system.

Moreover, concerning this development phase, the feature of real-time monitoring provided by the software mentioned above allowed checking the behaviour of the new installation during the flight, providing useful information about the safety of performed tests.

Afterwards, a flights campaign has been performed in order to acquire all information needed to certify this new installation and verify the effectiveness of a production-like system. In particular, during this experimental activity, the following data have been measured:

- *MVA* acceleration (rotating system), in order to calculate the load provided by the anti-vibration device and acting on the elastic rod
- M/R mast bending (rotating system) in order to evaluate the effect of this new installation on the load transferred to the mast component
- In cabin vibration level (non rotating system) in order to assess the effectiveness of the anti-vibration device

All the rotating system channels have been successfully acquired with the wireless data log and subsequently processed, as for "standard" instrumentation, in order to support certification process.