

# Wireless Data Logger MSR145WD Measures Aircraft Seat Data

*Alan Lowne & Wolfgang Hascher*

Mini data loggers are commonly used in machine, system, or transport monitoring, but they can also be used with great benefit in many other applications. One of these is the development of new generations of aircraft seat components.

Aircraft seats must be comfortable for humans, easy to maintain, mechanically stable, and manufactured with high quality. An important point, however, is that they must also be very light, because each extra pound of mass leads to increased operating costs due to greater fuel consumption and higher CO2 emissions. All seat manufacturers in the aircraft industry are therefore keen to optimize both the ergonomic aspects and the weight of the seats.

## Great weight savings can be achieved

The Swiss company Lantal Textiles AG has been active in this sector for a long time. Lantal is a leader in the design, manufacture, and marketing of textiles and services for international air, bus, and rail transport. The company developed its "Pneumatic Comfort System" several years ago. Its principle: air-filled cushions replace the conventional foam padding. This ensures both an increased adaptive comfort and a reduced seating weight. Approximately 3 to 6lbs per business class seat and approximately 6 to 11lbs per first-class seat can be saved over conventional polyurethane upholstery, and with an expanded range of functionality. The cushion pressure is distributed optimally through the air chambers, and the passenger can adjust the degree of hardness to personal preference. Both in the seat and in the reclining position, the air-filled cushion automatically adapts to the desired conditions - attractive marketing arguments for airline companies! For this purpose, of course, sophisticated pressure control using pumps and valves is necessary, in order to maintain these "comfort ratios" for the passenger despite any change in cabin pressure. The pneumatic comfort system must be completely maintenance-free, so the operation of the pillows needs to remain unchanged throughout the life of the product. This type of aircraft seat is now used by a large number of international airlines, mainly in the First and Business Class cabins.

## Using Mini-loggers to investigate pneumatic control

Lantal Textiles AG (Switzerland) uses the MSR145WD radio data logger from MSR Electronics GmbH (Switzerland) for the development and long-term testing of related pneumatic control technology. These miniature data loggers can measure and record the parameters of temperature, humidity, pressure, light intensity and acceleration / position using internal sensors set to appropriate sampling intervals. A built-in OLED color display shows parameter values. These loggers are powered by high-capacity rechargeable batteries and have recording space for around 1 million memory values, which can be read out via USB, or wirelessly via the radio standard Bluetooth Low Energy.



Lantal has installed MSR145WD loggers for test experiments inside seat air cushions (shown here without cover) with the pressure values being transmitted to the outside via Bluetooth transmission. A passenger is unaware that the seat is in any way unusual since it has standard airline covers. Lantal also tests pneumatic cushions fitted with the tiny data loggers on laboratory test stands, using Bluetooth transmission to check the pressure conditions. The company employs a dozen of these loggers in their development laboratories.

## Accurately recording pressure values

During the experiments, the aircraft-cabin internal pressure must also be taken into account since the air pressure in the cushions must be adjusted according to the ambient air pressure which changes during take-off and landing as well as in-flight. It is important for the development of the pneumatic system, the electronics, and the associated control technology, that the cushion pressure values in the range of 10 to 2000 mbar (with an accuracy of  $\pm 2$  mbar) be detected with simultaneous high-resolution temperature using the internal sensors.



*Cabin interior pressure diagram on a flight from Zurich to Los Angeles.*

During the flight at high altitudes when the cabin pressure is greatly reduced, the pressure in the seat cushions must also be adjusted correspondingly. The average cabin internal pressure during a transatlantic flight is about 900 mbar - during the cruising flight it is lowered at high altitudes down to about 780 mbar - the pressure differences are thus above 230 mbar. The normal pressure on the earth's surface is an average of 1013 mbar. During these pressure differences, the internal pressure in the seat cushion must be correctly adjusted, tested with the loggers on the test bench. The relative humidity from 0 to 100% and the 3-axis acceleration in the range of  $\pm 15$  g are further parameters which are of interest for experiments of this type. Using high sampling rates, all pressure values and other parameters are stored in the MSR loggers. Thanks to their mechanical robustness, these tiny loggers surpass these tough test scenarios without mechanical or electrical damage. They can also be used under very unfavorable ambient conditions, for example in the rail and road transport and logistics industry, in automotive development, and in all different applications of machine and plant construction, requiring temperature logging in the range from -20 to +65 ° C.

#### **Data via Bluetooth and mobile network also into the cloud**

In order to be locally more independent and even to be able to read measured values worldwide, MSR Electronics has developed its own cloud application. The measured data sent by the data logger via Bluetooth to a nearby mobile radio interface are transferred from this mobile radio gateway into the MSR SmartCloud, where they can be retrieved from anywhere in the world, password protected. Using the smartphone app "MSR DataLogger" data records can be started, stopped, read out, and sent to the MSR SmartCloud at any time.

The MSR SmartCloud system allows for data storage and also alarm actions. The MSR logger can store data via USB, Bluetooth and smartphone, laptop or (with a special box) into the cloud. Alarms are then generated via SMS, mail, or web browser to authorized recipients. The near-range transmission of BLE is an advantage for applications in which measurement data must be gathered from difficult-to-access locations like industrial equipment or rotating machine elements. The BLE wireless standard allows the user to transmit and record the data in a 65 foot radius regardless of the location.



The mini-data loggers shown in this aviation application can also be used in a wide variety of measuring technology applications, which go beyond machine and transport monitoring or logistics. Laboratory and test bench measuring systems are also suitable applications, and similar loggers are already in use in spaceflights for recording mechanical loads.

***For more information, please see: <http://bit.ly/1TWhZCE>***